SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXIV.—No. 4. [NEW SERIES.] NEW YORK, JANUARY 21, 1871. $3 per Annum. [IN ADVANCE.]

Watts and Phelps' Variable Cut-off.

Our engineering readers will be interested in the engravings we herewith present of a new variable cut-off, invented by Wm. Watts and Fred. A. Phelps, of Newark, N. J.

The motions of this new valve gear are all positive, and the parts are all not only strong and durable, but easily adjusted to equalize the cut-off at each end of the cylinder. It has nothing about it which seems likely to get out of order, and its operation (as shown by indicator diagrams taken from an engine, with this gear attached, by Mr. F. W. Bacon, whose engineering skill is familiar to many of our readers), gives economical results which justly rank as first-class, notwithstanding its freedom from the complications which, in many kinds of valve gear, necessitate constant attention and frequent repair.

The controlling power of the governor is transmitted through the connecting rod, A, Fig. 1, the sector, B, the connecting rod, C, and the toothed sector, D, to a cylindrical rack turned on the sleeve, E. The sleeve, E, is feathered to the shaft, F, and slides longitudinally when acted upon by the parts, A, B, C, and D, while turning with the shaft, F, the rotation of the latter being accomplished through a system of gearing, as shown.

The sleeve, E, also carries two cams, shown in section in Fig. 2, at G, which, turning under the toes of tappet arms, H, Figs. 1 and 2, attached to the vertical stems, I, Fig. 2, of the cut-off valves, J, Figs. 2 and 3, raise the valves and let them fall abruptly at the proper point of cut-off to which they are adjusted.

The cut-off valves, J, are of the "grid" variety, and slide on the backs of the principal valves, which latter are actuated in the usual way from an excentric on the crank shaft.

The sliding of the sleeve, E, on the shaft, F, causes the cams to let the cut-off valves fall earlier or later in the stroke, according as varying velocity affects the governor.

If the the belt break or any other derangement of the governor occur, the travel of the sleeve, being a little more than the length of the cam, allows the toes of the tappet arms to drop off the cam on to the shaft, closing the cut-off valve ports and instantly stopping the engine. In starting the engine, a lever and cam, K, Figs. 1 and 2, is used to raise the cut-off valve and open the port. The motion of the engine then operating on the governor draws the sleeve along so as to bring the cams under the tappets, and thenceforward the gear works automatically.

It will be seen that this gear can be made to cut off from zero to any part of the stroke desired, and that it can be adapted to many kinds of engines in popular use, with but slight alteration.

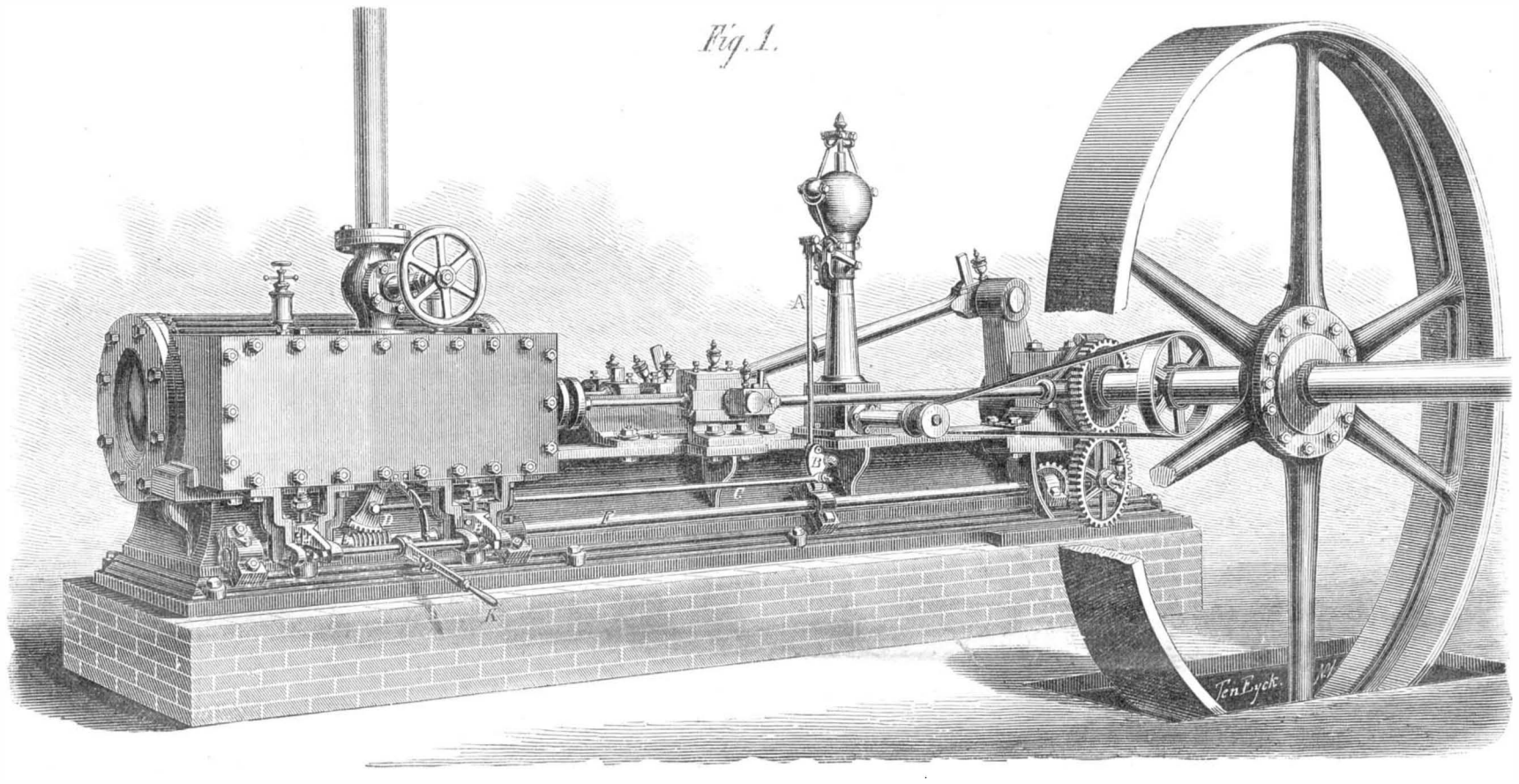
Fig. 3 is a horizontal section through the cylinder and valve chest which aids in showing the relations of the parts.

As an illustration of the effectiveness of this valve gear we may say that with a double cylinder engine, having cylinders five feet by twenty-eight inches, running at forty-seven revolutions per minute, in a large thread factory, in Newark, N. J., much difficulty was at first experienced on account of the variable power required to drive the machinery. The variations were so great that it was found impossible to govern the engine by the throttle-valve governor.

The application of the valve gear we have described, in connection with a medium-sized Porter's patent governor, has reduced this variation, so that, including the variation arising from inexactness in starting the engine at the precise moment for work to commence, and stopping at the end of each half day, its maximum irregularity does not exceed ten revolutions per day of ten and one half hours, as determined by a counter and attested by the engineer in charge.

The cut-off is extremely sharp, as shown by the diagrams, and the work required of the governor is very slight, it being only that required to overcome the friction of the connections, and to move the sleeve longitudinally on the shaft, F, as above described. As a consequence the action of the governor is delicate and sensitive to very slight variations in speed. These engines are manufactured by Watts, Campbell & Co., proprietors Passaic Machine Works, corner Passaic and Ogden streets, Newark, N. J., who may be addressed for rights or further information.

Fig. 1.



WATTS AND PHELPS' VARIABLE CUT-OFF.

Fig. 2

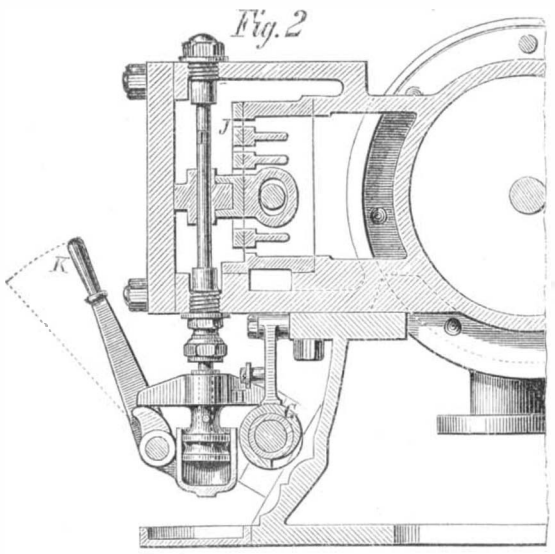
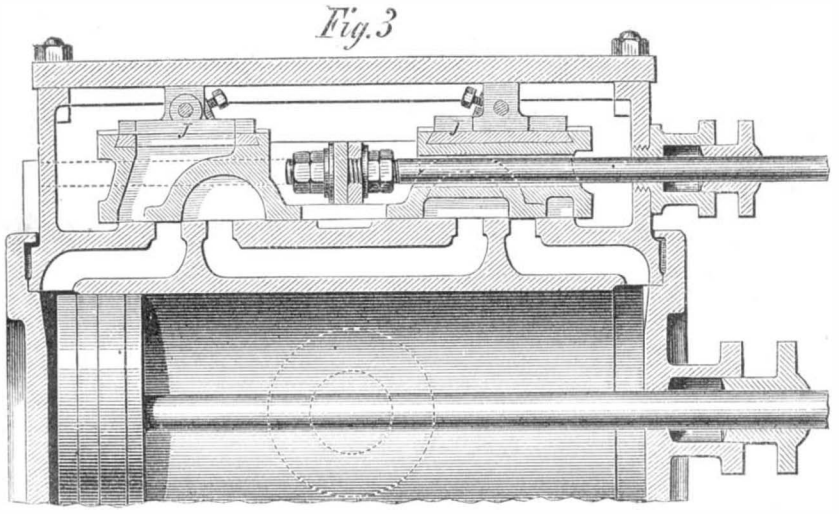


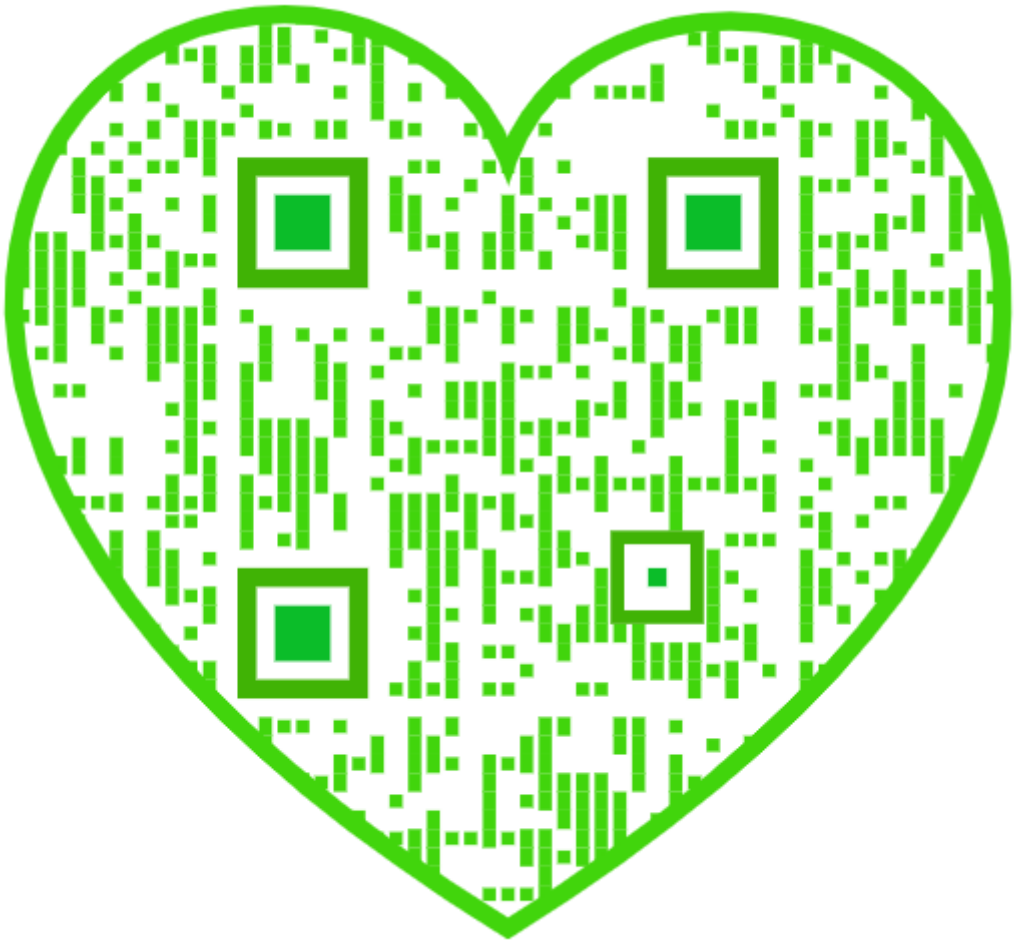
Fig. 3



French Ironing Table.

A French mechanic, resident in Algiers, has, it is said, recently invented an ironing table, by which, after the articles have been cleansed, steam can be directly applied during the iron process, for the purpose of producing a fine finish. The ironing table is hollow, of a long, oval shape, and is composed of metal. The surface is slightly curved, and is perforated with many small holes. Steam is conveyed to the interior of the table by means of a pipe leading from a generator placed upon a small furnace, at which the irons are heated. The method of ironing is conducted as follows: The article is spread over the table, the key in the steam pipe is opened, and the steam, rushing into the hollow interior of the table, escapes through the small holes, and penetrates the fabric from below, while the operator is passing the hot flat-iron over the upper surface. This process, it is stated, produces a very fine steam finish, equal to that of new goods, and a great saving of time over the old methods is effected. The total cost of the entire apparatus, that is, a steam generator, a furnace, and two tables, is about $200. It may be mentioned, that the second table is made of a shape especially adapted for ironing pantaloons. The cost of this apparatus precludes its use for general domestic purposes. In laundries and dyeing establishments it would be serviceable.

© 1871 SCIENTIFIC AMERICAN, INC



XYLONITE.

[By Daniel Spill, before the London Photographic Society, Dec. 13, 1870.]

The name "Xylonite" is taken from the Greek word *xulon*, "wood," and the material upon which this name has been bestowed is derived from wood or woody fibers. These are converted by the action of mixed nitric and sulphuric acids into a rough form of xyloidine, which, being subsequently dissolved into a species of collodion, constitutes the base of a further manufacture.

The material was first introduced to the notice of the public at the International Exhibition of 1862, by Mr. Alexander Parkes, of Birmingham, at which time it had not yet become an article of commerce; subsequently it was manufactured on a commercial scale, and introduced to the world for a short time under the name of "Parkesine" (named after the inventor). The manufacture having been much improved, and the patented solvents and machinery almost entirely remodeled, it was considered advisable that the name should also be changed, and "Xylonite," as being more appropriate for a derivative of xyloidine, was adopted.

The soluble base of this manufacture may be made from any wood or woody fiber, or fiber-producing grasses, old rags, waste from cotton or flax mills, old rope, starch, Esparto grass, "half-stuff" of the paper-makers, etc., but preferably using waste fibrous material from cotton and flax mills. No doubt most of you are well acquainted with the process of converting cotton into a soluble modification by the action of acids; but for the information of those who are not versed in the matter, I would explain that any one of the before-named substances which may be chosen for the conversion should be first freed from all extraneous matter, by boiling with alkali or soap and water, well washed, and dried, so as to leave nothing but a nearly pure fiber for the subsequent treatment. A bath composed of one part, by weight, of concentrated nitric acid, four parts of concentrated sulphuric acid, and one of water, having been prepared and cooled to about 70° or 80° Fah.; a weighed quantity of the purified vegetable fibers is then immersed therein for a period of from one to fifteen minutes or longer, according to the degree of solubility required.

The next step is to remove the uncombined acids as quickly as possible, either by draining or pressure (the latter preferred), and then wash quickly in a copious supply of water until the last washings are neutral to test paper. If the fiber should at this stage retain any coloring matter (which is not unfrequently the case), it may be submitted to the action of any of the ordinary bleaching agents without injury to the chemical condition of the xyloidine, which has now to be carefully dried at a low temperature or by pressure (the latter being preferred), when it will be ready for dissolving. The solvents commonly employed in the preparation of photographic collodion are too expensive to permit of their use in the xylonite manufacture, and we have recourse to solvents, either fixed or volatile, or judicious mixtures of both these qualities, by which an almost endless variety of materials can be prepared. The volatile solvents mostly used are wood-spirit, alcohol, aldehyde, mineral naphtha, benzole, and other hydrocarbons; and the non-volatile or fixed solvents are oil and camphor, or natural camphor-oil, linseed, castor, and other vegetable oils.

The introduction of these fixed solvents is an important improvement and economy in the manufacture of xylonite, obviating much loss by evaporation and inconvenience arising from contraction of the material. To prepare these solvents take, say, 100 parts of castor oil and heat up to about 250° or 300° Fah., then dissolve therein about fifty parts of camphor, and while in the heated condition add the xyloidine, which readily dissolves into a stiff paste, and is then ready for a subsequent process. The condition of xylonite may be varied from the flexibility of morocco leather to the hardness of ivory or stone by the judicious combination of xyloidine, oil, and pigments.

Having explained the mode of preparing xyloidine, its nature, and properties, and those of its solvents, I will now treat of the conversion of the xyloidine into xylonite and of its application to the arts. Practically, in our manufacture, it is not necessary to dry the xyloidine thoroughly before dissolving it; pressure alone will remove 90 per cent of its moisture, and in this state it is quite uninflammable, even when held in contact with fire, and yet will readily dissolve in the before-mentioned solvents. Five parts of solvent will reduce one part of xyloidine into a stiff paste by stirring alone; but to blend the materials more perfectly the mixture is masticated or ground between rollers until the incorporation is completed; it is next removed into a strong vessel having a perforated bottom covered with a finely-woven wire sieve, which vessel is then placed beneath the piston of a powerful press, and the paste is thereby forced through the sieve, in order to strain it from all mechanical impurities or undissolved particles of xyloidine. This purified xyloidine is next removed, weighed, and the requisite quantity of oil or pigments added thereto, and then passed to a heated masticator or grinding rolls, or into a retort provided with mechanical stirrers, which, for volatile solvents, are inclosed in an air-tight casing, the latter being in connection with a condenser and vacuum apparatus during the process of mastication or agitation. The volatile solvents are evaporated by the heat and vacuum, and conveyed away to a condenser for future use. When non-volatile solvents are used, the last-named apparatus is not required, heat and mastication being sufficient. When the paste is masticated into a very stiff condition it is removed into a powerful calendering machine, where it is rolled into sheets of any required thickness, after which it is placed in a seasoning-room heated to 100 to 120° Fah. for periods varying from fifteen to thirty days, when it is ready for use.

To produce the mottled or marbled patterns, the paste is first masticated into a stiff dough, each color separately, then rolled into rough sheets, and, while in a plastic condition, weighed quantities of two, three, or more of these colored sheets are piled upon each other in such a way as is needful to obtain the desired pattern, and the whole are passed together through calender rolls, the workmen taking care to relay or fold the sheets between each calendering so as to alter the position of the colors; and the material is finished as already described.

When preparing hard compounds with the non-volatile solvents it is necessary to use oxidized oil, such as linseed oil, which will dry and become hard in the process of seasoning. The flexible kinds are prepared with cotton-seed oil or castor oil, which will not become hard. For coating or water-proofing fabrics, the paste may be applied in a semi-fluid condition with an ordinary india-rubber spreading knife, or machine, or it may be applied in a very stiff paste by the aid of calender rolls.

In preparing non-actinic sheets for photographic purposes, no pigments are used, but semi-transparent colors only, such as will arrest the passage of the chemical rays, and furnish a material suitable for windows of the dark room in place of the ordinary yellow glass, but of sufficient depth of color to arrest all the actinic rays of sunlight. In this state the sheets are flexible, durable, and light. When spread upon fabrics it forms a water-proof material, useful for photographic field tents, giving the operator an abundance of light of perfectly non-actinic quality, thus having a "dark" room combined with a considerable amount of light for personal comfort, fort, and avoiding theuse of yellow glass windows altogether.

On a future day I hope to offer a flexible and structureless substitute for the glass negative supports. My experiments in this direction are not at present sufficiently advanced to enable me to speak positively on the subject. The applications for the material outside the photographic world are almost innumerable; I may instance a few of them—namely, insulation and protection of telegraph wire, coating fabrics for water-proof garments, making artificial leather for furniture covering, and book-binding, writing tablets, substitutes for ivory, bone, horn, tortoiseshell, hard woods, marble, etc., knife-handles, friction and gear wheels, also bearings for machinery, spinners' bosses, billiard-balls, pianoforte-keys, walking stick and umbrella handles, etc.

It may be turned in a lathe or wrought by the cabinet-maker's or brass-finisher's tools; can be embossed or molded by heat and pressure, and may be polished like ivory, wood, or stone. It is unaffected by atmospheric influence, heat, water, or grease.

THE TRIUMPHS OF SURGERY.

The above is the title of a lecture delivered by Prof. Frank H. Hamilton, M.D., LL.D., of Bellevue Hospital, before the American Institute, Friday evening, Jan. 6th, being the third of the course of lectures now in progress at the Academy of Music. We hardly expected from the pre-announced title of the lecture that it could be made of that popular character which pleases a mixed audience, and we were not disappointed in our expectations. However the lecturer grappled with the difficulties of the task in such a way that relieved the tedium of its unavoidable technicalities to those who are unfamiliar with anatomical terms and on the whole succeeded in holding the interest of his audience better than we at first anticipated.

We shall make only one or two brief extracts from this lecture, as an abstract of the greater portion could scarcely be made without involving ourselves in the same dilemma which the lecturer experienced in translating a discourse purely technical into popular language.

On the head of "Plastic Surgery" the lecturer called attention to the truly wonderful discovery made recently by a young surgeon, M. Reverdin, at the Hospital La Charité, in Paris. He said: There are certain ulcers and wounds of integument which, solely on account of their extent, have hitherto been considered incurable. To illustrate by an example: If the whole of the skin were stripped from the arm no effort of nature or skill of surgery, however long continued, could ever succeed in restoring the tegumentary covering. At least such has been the statement until to-day, and for the following reasons: First, because new skin never forms except from the margins of the old; and second, new skin can never be projected from the old beyond a few inches—perhaps two or three at most. But many examples are presented in surgery in which the integument is destroyed by burns or by machinery to such an extent that repair, limited by these invariable laws, utterly fails to complete the restoration; and great deformity from contraction, a perpetual ulcer, or amputation, have been the only alternatives.

I must be permitted to mention my own humble contributions to the relief of this condition made in the same direction as that of M. Reverdin, but which his more brilliant discovery has completely eclipsed. By a successful operation upon a patient at the hospital of the Sisters of Charity, in Buffalo, in 1854, I demonstrated that a comparatively small piece of skin, perhaps three inches square, taken from one leg and transplanted to an open ulcer upon the opposite leg, which was eight inches square, would, after becoming attached, grow, and increase in size by the projection of new skin from its margins, until the whole ulcer was closed in. This operation has been repeated many times by myself and others since the date of my first experiment, and with similar results. But listen now to what M. Reverdin has done. He has taken a piece of skin not larger than a lentil seed from the arm of a patient, and inserting it in the midst of the raw, granulating flesh of an ulcer, it has become the center from which new skin has been formed, and has extended on all sides; and by making several of these minute insertions, the whole sore has become speedily cicatrized.

Assisted by my house surgeon, Dr. Williams, I have repeated these operations at the Charity Hospital already more than fifty times, the results of which experiments have been published in the *New York Medical Gazette*. My first patient refused to submit to the operation, fearing that the excision of the piece of skin would be painful; but having cut a small piece from my own arm, he permitted me to insert it into his open wound. This trivial operation, made in the presence of a large number of others suffering from chronic ulcers, gave them an assurance that it was almost painless and bloodless, and no further difficulty was experienced in prosecuting the experiments.

We had but six successes from this large number of transplantations, but the principal causes of failure have been ascertained, and will be avoided hereafter. What is most remarkable in this thing is that the minute piece thus implanted seems to fall off in a few days; but at the point where it rested, after the lapse of a week or two more, a small white spot is seen gradually coming into view, like a cloud upon a clear sky. The original and parent structure disappears, but a cell or seed is found to have been deposited capable of indefinite growth and development. The precise law which governs this curious process we do not pretend to have ascertained; but having discovered the fact, and availed ourselves of it in the cure of our unfortunate patients, we can afford to wait for the explanation.

It is now just twenty-six years since the discovery of a method by which surgical operations could be made without causing pain, an end which was attained only after many centuries of inquiry and experiment. We find evidence that this subject occupied the attention of surgeons from the commencement of the Christian era. The Roman physicians, in the first century, speak of the use of the wine of mandragora for the purpose of inducing sleep and insensibility when the knife or actual cautery were to be employed; and Pliny observes that some persons are put to sleep by the use of mandragora. Shakespeare more than once alludes to the sleep and inebriation which it induces. Hemlock, hemp, opium, and alcohol have been suggested, and at one time or another employed with unequal but rarely satisfactory results. Mesmerism and magnetism have had their pretended successes. Pressure and cold have been applied directly to the parts to be operated upon. Juvet recommended a ligature to be placed above the point where an amputation was to be made. Moore preferred pressure made more directly upon the nervous trunks supplying the diseased member. Richerand advised dipping the cutting instrument into hot water. Others, with the same purpose, have immersed the knife in sweet oil.

Weary of these fruitless experiments, surgeons had at length settled into the conviction that a sharp knife, with a light and dextrous hand, or, according to the old maxim, to cut "*tuto, cito, et jucunde*," were the only means we could ever hope to possess for alleviating the pains of an operation. In the edition of Velpeau's "Surgery," translated by Townsend, of this city, and ready for the press in December, 1844, occur the following passages: "To avoid pain in operations is a chimera that we can no longer pursue in our time. A cutting instrument and pain, in operative surgery, are two words which are never presented separately to the mind of the patient, but in an association which he must of necessity admit. . . It is to the hand of the operator and the quality of the bistoury that we must look to obtain the desired result. Let the hand be light and steady and the bistoury smooth and well sharpened, and give with the first stroke the whole length and depth that the incision should have, if you can do so without danger; then act with promptitude and without hesitation, . . and you will have no other pains to encounter than those which are inherent in the operation, and which nothing can separate from it." These words, my auditors, were the best legacy of comfort the most accomplished surgeon of the world could give to us, to avoid the pain of an operation, in December, 1844. The same month in which these words were uttered Dr. Horace Wells, a dentist of Hartford, Conn., made his first successful trials with nitrous oxide, and demonstrated that to avoid pain in surgical operations had ceased to be a chimera. There is, as I regard it, another singular coincidence connected with this discovery. The nervous aura which establishes an intercommunication of intelligence and sensation between the various members of the body, has been supposed to be identical with electricity. Anesthetics, in their power of causing temporary insensibility, indicate perhaps a control over the nervous electrical currents. In May, 1844, five months before the discovery of the anesthetic properties of nitrous oxide, the first message was carried over the telegraphic wire constructed by Morse, from Washington to Baltimore, in these words, very appropriately chosen by Miss Ellsworth of Hartford, Conn., "What hath God wrought?"

Electric cords had been laid which were ultimately to bind all the nations of the earth in one united system, establishing a universal and coincident sympathy throughout the human family. In the same year the electric cords of the individual man were in like manner brought into subjection, so that hereafter sensation, intelligence, and all communication between the different portions of the body could be interrupted or established at pleasure. The electric currents of the body and of the world were henceforth, by Divine permission, under the dominion of man. From the same humble

© 1871 SCIENTIFIC AMERICAN, INC

New England town a voice has answered to voice, as if in choral anthem, "What hath God wrought?"

"From harmony to harmony
Through all the compass of the notes it ran,
The diapason closing full in man."

The discovery of the anesthetic properties of nitrous oxide was followed in 1846 by the discovery of a similar property in sulphuric ether, by Drs. Jackson and Morton, of Boston. In 1847 Dr. Simpson, of Edinburgh, discovered that chloroform was a much more powerful anesthetic than either nitrous oxide or ether, but experience has shown that it is far less safe.

The Defense of Paris---French and German Siege Artillery.

A military correspondent of the London *Times* supplies some interesting information as to the relative powers of the attack and the defense of Paris. He says:

The guns mounted on the forts of Paris are quite equal in power to any that the besiegers could bring opposite to them. If the German batteries were to bombard the city, it could only be after having reduced all the forts within easy range, otherwise the batteries firing against the city would be exposed to bombardment in their turn from permanent forts with bomb-proof cover at a comparatively short range. To reduce one fort might be an easy task if the fort stood alone; but each member of the encircling guardians of Paris supports, and is in its turn supported, by others, so that were one to fall no large force could march through the gap thus made without being exposed to the concentrated fire of many heavy guns, such guns as have never been used in war until now, if we except the isolated rounds fired from the *Affondatore* during the battle of Lissa.

The forts are armed with heavy ship guns, breech-loading all of them, made of cast iron, and strengthened by steel hoops round those portions of the piece most exposed to the shock of the explosion. The guns are rather untrustworthy in strength, but, under the present circumstances, there is time enough available to take any precautions that may be thought advisable. So far as is known, the gun of highest caliber now in Paris has a bore measuring not more than ten and a half inches across its diameter. The projectile weighs little short of 500 pounds, but a comparatively large charge cannot be used on account of the danger of bursting, unless the Russian plan of burying the piece in the earth be tried, as men say it has been lately. There are rumors of a wonderful new gun of huge dimensions found accidentally in Paris, and soon to be used against Versailles. There is no doubt that a gun can be made, and has been made in England, capable of such work.

The nearest approach to Versailles from the French side has been made by a gunboat, which has come close up to the bridge at Sevres. The distance, as the crow flies, is less than five miles—about 8,500 yards. English artillerists have not, with some exceptions, aimed at building guns for extraordinary ranges, yet 8,500 yards, the distance between the French gunboat and the royal quarters at Versailles, has been more than attained over and over again by English guns, and I believe lately by French guns from the forts. An experimental Armstrong 32-pounder, weighing only 26 cwt., with a charge of 6 lbs. and an elevation of 33 deg., sent its projectile 9,153 yards. The range was carefully measured. Mr. Whitworth states that his little 3-pounder, fired at Southport, attained a range of 9,688 yards. The long experimental 7-inch gun of six tuns, designed by Mr. Lynall Thomas, with 25 lbs. of powder, propelling a shot of 175 lbs., and fired with an elevation of 37½ degrees, ranged 10,075 yards. There have been several other instances of long ranges, and there would be more but for the general uselessness of firing at distances where no aim can possibly be taken.

The Prussians buy their heavy guns from Krupp, the great steel-maker of Essen; and instead of indiscreetly naming the pieces actually present before Paris, it will be better to state what guns Herr Krupp makes, and the Prussians may have here if they please and the roads allow. In the list are placed 13-inch, 12-inch, and 11-inch guns, but it would be deceptive to commence with them. Two of the 11-inch guns were made for experiment, and tried two years ago, for the Russian Government. The length of time required to make Krupp guns, and the certain knowledge that Prussian vessels of war hitherto carry nothing approaching these calibers, permit it to be said, without fear of error, that, except the monster gun shown at the Paris Exhibition in 1867, rather as a magnificent work in steel than as a gun for real service, there is nothing available for the siege of Paris more powerful than the 9·267-inch gun, a little heavier, but otherwise equal to the gun of the same caliber tried against the English 9-inch gun at Tegel, near Berlin, two years ago. The only novelties—already described in the German papers—are the so-called 50-pound rifled mortar, which throws a projectile of nearly 120 pounds, and a rifled howitzer, called a 25-pounder, and throwing a shell of nearly 65 pounds.

These facts fairly justify the conclusion that it is not by bombardment but by famine that Paris is likely to be reduced, and that not for reasons suggested by humanity, but because military wisdom so dictates. It has sometimes been remarked that the Germans have not shown the same extraordinary military talent in sieges as in battles. It should rather be said that in case of invasion by overwhelming forces the only check to the invader is to be found in fortresses, which cannot be outflanked, cannot run away, and detain for a considerable time a disproportionate number of the enemy.

Applied Science Popularized.

We can find no better term than the above to express what we conceive to be the aim of that admirable journal, the SCIENTIFIC AMERICAN. Its success in achieving this end is as notable as the aim is legitimate and high. And whether as regards the end, or the "ways and means" of securing it, to name the SCIENTIFIC AMERICAN is to praise it. We are surprised, at each successive issue, at the versatility, freshness, and practical value of its table of contents. We know of no other journal which, in its chosen field (a very varied one in this instance), so nearly exhausts it in every new issue. And it is remarkable how completely it avoids repetition and triteness in doing this. Not less noticeable is it that in very few instances indeed does it publish anything of doubtful value, either in principle or application. On this account the SCIENTIFIC AMERICAN singularly enjoys the confidence and deference of both mechanics and inventors, and of the many able writers who address the public through the daily press. No paper of its class is so frequently quoted, and certainly the suggestions of no other come, *prima facie*, with more authority. In reading its ample, neat, and entertaining pages, from week to week, we are always at a loss what few articles out of the many to signally commend, by extract or reference, in our columns. Its elaborate articles—whether editorial or contributed—are always attractive, both for matter and manner; and as to its illustrations, our only cause of regret is, that we cannot transfer them along with the subject matter to our own columns.

That the SCIENTIFIC AMERICAN has a large and intelligent *clientage* (if that word may be thus adapted) is most apparent, from the frequency with which its readers contribute, by way of brief inquiry and suggestion, to its columns.

None but a paper of large circulation could, it is apparent, thus embrace in every issue the whole of a field so large and varied; and we are gratified to learn that the increase in the amount and variety of its contents is amply repaid in increased popularity and enlarged circulation. Its circulation now extends among all peoples who speak the English language—as its advertising patrons constantly learn, by letters of inquiry from the most distant and unexpected quarters.

The SCIENTIFIC AMERICAN announces its purpose to outdo itself the coming year. And, as if it were not enough to thus make itself attractive "for its own sake," it now offers to every person sending a club of ten subscribers a copy of Sartain's steel engraving (2x3 feet) of Schussell's celebrated portrait group, "Men of Progress." · This composition (scene in the Hall of the U. S. Patent Office) embraces fifteen figures of inventors—among them Morse, Colt, Goodyear, Ericsson, Henry, and Hoe.—*Chicago Railway Review.*

Another Motive Power.

The stone drilling machines in the Mont Cenis tunnel, as well as, we believe, in the Hoosac tunnel, are moved by compressed air, which, we are told, can be fed to, and used in, steam engines without difficulty. It is now proposed to bring into common use this motive power, compressed air, in several cities of this State, and in a very ingenious manner.

Some weeks ago a gentleman, who has undertaken this enterprise, visited Rochester, which has an important water power, with the object of using such of this force as now goes to waste, to accumulate a store of compressed air. By a very simple contrivance he believes himself able to use cheaply the power of the falling water to condense air, which is then to be drawn off into reservoirs, whence it is proposed to supply it, through large air-tight pipes, to machine shops and other places requiring motive power at a distance from the reservoirs.

If this plan succeeds at Rochester, it is said that an attempt will be made to utilize the immense force of the Niagara Falls to compress air, which is to be conducted to Buffalo, twenty miles distant, and there turned to account as a motor.

Some calculations which have been made induce the persons engaged in this novel enterprise to believe that the equivalent of a "horse-power," which costs, when steam is used, in this city, about $150 per annum, can be furnished by them at the reservoir of compressed air, for about $12. When it is conducted to a distance, the cost of maintaining conducting pipes would be an added element of cost; but this could not be very great.

The pressure of air needed, is, it is said, equivalent to about seven atmospheres. Of course, no fires will be used with this motive power; the danger of violent and destructive explosions will be at an end; air engines will be much more easily managed than those worked by steam; and if compressed air can be cheaply furnished in cities, it will become an immense convenience in many ways.

Its uses need not be confined, either, to places having falls of water at hand; on the seaboard the power evolved in the rise and fall of the tides could be utilized, to compress cylinders of air cheaply; and if the plan succeed at all, there appears to be no reason why steam should not be superseded, in New York, by air as a motive power; or why ships should not be loaded and unloaded, goods hoisted in warehouses, and the lifts in hotels and public buildings moved by means of compressed air.

Geography of the Sea Bed.

At the meeting of the Royal Geographical Society, held on Nov. 20, a paper was read "On the Geography of the Sea Bed," by Capt. Sherard Osborn, R. N. The author gave an account of our present knowledge of the configuration of the bed of the ocean, as derived from Admiralty surveys and submarine telegraph expeditions during the last fifteen years. His explanations were illustrated by a number of diagrams showing sections of the North Atlantic and other oceans. It has been definitely ascertained that the greatest depth of the ocean does not reach 3,000 fathoms in any part where telegraphic lines have been laid. The bed of the North Atlantic consists of two valleys, the eastern extending from 10° to 30°, the western from 30° to 50° west longitude. The extreme depth of the eastern valley is under 13,000 feet, which is less than the altitude of Monte Rosa. This valley has been traced southward to the equator. It is separated from the western valley by a ridge in 30° west long., in which the average depth is only 1,600 fathoms. This ridge terminates to the north in Iceland, and southward at the Azores, so that it is volcanic in its character at both extremities. Its extreme breadth appears to be under 500 miles, and the Atlantic deepens from it on both sides. Explorations carried on in the Mediterranean, the Red Sea, and the Indian Ocean, showed similar uniformity in the level of the sea bottom; and the general conclusions arrived at by Capt. Osborn were that in the deep sea there is an absence of bare rock, and that there are no rough ridges, canons, or abrupt chasms. Moreover, that the bed of the deep sea is not affected by currents or streams, even by those of such magnitude as the Gulf Stream; but that it resembles the prairies or pampas of the American continent, and is everywhere covered with a sort of ooze or mud, the *debris* of the lower forms of organic life. In the course of the discussion, Professor Huxley said that, viewed on a great scale, there would be but slight difference between the large general features of the ocean bed and the dry land; but that the smaller features would be different, as the effects of denudation would not appear in the deep ocean bed. To the naturalist, the observations of the telegraphists were of great importance, as showing the existence of low forms of animal life in the deepest seas; and recent discoveries had shown that the most characteristic organisms of tho deep-sea beds, named coccoliths and coccospheres, existed at all depths, even in shallow shore waters, and were also found fossil in sedimentary rocks of all epochs—a discovery of great interest, as confirming the view of the uniform conditions of submarine deposits in all ages of the earth's history He was opposed to the view that the animals found living in the dark regions of the lowest sea depths depended for light upon the phosphorescence of some of the species, and saw no reason for concluding that they could not, like fungi, exist without light. He also doubted the accuracy of the very low temperatures said to have been found at great depths, and thought that those taken in the Indian Ocean might be explained by the fact that they were taken with thermometers not rectified for pressure.—*Nature.*

The U. S. Signal Service.

The post of Fort Whipple, Virginia, has been maintained during the past year as a school of instruction and practice in the duties of the signal service, at which such officers of the army and navy as might be designated for instructors in this branch of military duty, in their respective services, may themselves first receive a thorough knowledge of it. It has been an object also to maintain a nucleus for the service capable of being expanded upon any emergency. The equipments of the school for field practice have consisted of one section of a field telegraph train, complete in its appointments, eight telegraphic instruments and batteries, and the necessary testing apparatus for the instruction rooms, and the requisite sets of signal equipments for day and night signaling. The theoretical instruction comprehends the study of the army manual of signals, the cipher manual, and text-books of practical telegraphy, and discourses, together with oral instructions by the instructor. An inspection of the school on the 19th of March, 1870, by the Honorable Secretary of War, resulted in his expressed satisfaction with its management, and the authorization to increase the strength of the signal service detachment there stationed to the minimum of a company, to appoint the necessary non-commissioned officers for the detachment, and to erect such temporary structures as were necessary to increase the efficiency of the school and promote the comfort of the command. During the year thirty-eight officers have been under instruction at the school, thirty-one of whom belonged to the navy, four to the army, and three to the marine corps. Of these, thirty completed the full course of instruction, and were declared competent as acting signal officers and instructors. Of the officers of the navy instructed, twenty-three have been assigned to vessels of the navy now in service, to diffuse, as instructors in their turn, a knowledge of the signal service throughout the navy, and to so provide for the thorough co-operation of the land and naval forces whenever occasion may require. The officers of marines instructed have been in charge of similar instruction given in the corps of marines. Of the army officers who passed the course, two have been assigned to duty as instructors, one as assistant in this office, and the other temporarily as officer in charge of the signal service detachment. In addition to the officers instructed in the school, forty-one observer sergeants, intended for assignment in the division of telegrams and reports for the benefit of commerce, have received, within the year, the theoretical and practical instruction necessary to fit them for their duties. In the pressure of other duties, the experimental practice usually had at this school, for the improvement of the signal and military telegraphic apparatus, had been, to a great extent, suspended. The established drills have, however, been continued and improved. It is hoped that facilities may be given to provide, during the ensuing year, a field telegraph train, as a model, as perfect in all its parts as ingenuity and experiment can make it.—*Report of the Chief Signal Officer.*

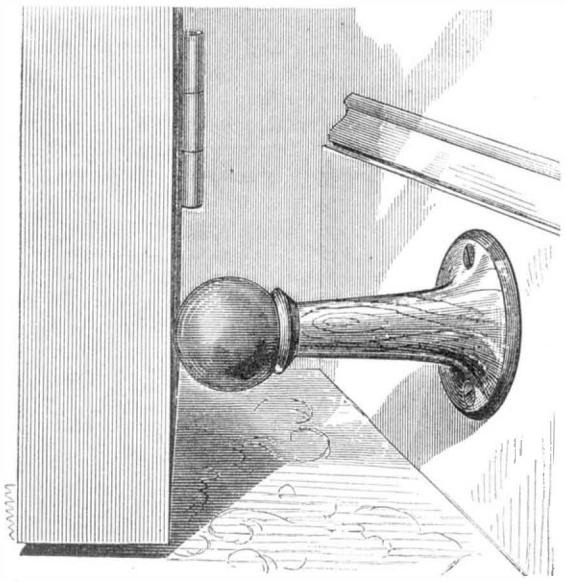
BOXFORD, CONN., is a quaint old Puritan town—not a glass of ale sold in the place. It borders on eight towns, is eleven miles long, and six miles wide, and has a population of eight hundred and fifty souls, about the same as one hundred years ago. Appropriately enough, the chief industry of the town is the manufacture of boxes for shoes and matches.

© 1871 SCIENTIFIC AMERICAN, INC

IMPROVED DOOR GUARD.

Our engraving illustrates a neat and useful door guard which is so simple in its construction and the use of which is so obvious, that it is, in connection with the engraving, scarcely necessary to describe it.

It consists of a stud screwed to the wash-board behind the door and tipped with a hollow elastic rubber ball or cushion, against which the door swings when opened, and which prevents noise, and prevents any injury to the door or to the



wall, from the concussion or from the striking of a key which may be left in the lock of the door.

Patented, through the Scientific American Patent Agency, May 17, 1870, by Charles William Gschwind, of whom further particulars may be had by addressing him at Port Republic, N. J.

Defects in Locomotive Boilers.

It will be well to notice an objection constantly urged by those who believe in the excellence of the locomotive boiler, which may be thus stated:—"The boiler can only be uneconomical by wasting heat, but if it wastes heat, that heat will be found in the smoke-box; it will manifest its presence in the high temperature of the escaping gases. But there is not a high temperature of the smoke-box, therefore heat is not wasted." This is a very logical proposition, which breaks down only at the end. No one knows accurately what the temperature is in the smoke-box. So long as an engine is not heavily taxed and the draft is moderate, it is indisputable that the temperature, especially if the tubes be long and small, is low; and there can be no question that engines moderately loaded and running at low speed evaporate more water per pound of coal, provided combustion be perfect, than does an express engine careering across country at fifty miles an hour with ten or a dozen heavy carriages behind it. The boiler quickly falls off in efficiency as the quantity of coal burned increases, and this is no doubt one reason why the cost of transport increases so rapidly in proportion to the speed, albeit it is one which has not received half the attention it deserves. But to return to facts connected with smoke-box temperature: Stephenson's experiments made in the neighborhood of Derby, in 1843, showed that in the ordinary locomotives then in use the temperature in the smoke-box was great enough to drive zinc off in vapor; and this metal requires a temperature of not less than 800° to melt it. As a result of these experiments, Stephenson introduced his well-known "long boiler" locomotives, many of which are still running on the Great Eastern and other railways, with tubes nearly fourteen feet long. The evidence usually adduced in opposition to the idea that a high temperature exists in the smoke-box, is based on the fact that the black paint put on outside lasts a long time; but this is not good evidence, because, first, the inside of the box is always lined with a thick coat of soot, which is an admirable non-conductor; and, in the second place, the smoke-box plates are exposed to the action of a violent current of air, which increases in its effect with the speed of the engine. Besides this, there is little doubt but that the products of combustion operated upon by a powerful draft rush direct from the tubes to the chimney, and are, therefore, drawn away from the sides and front of the smoke-box, which is always some inches larger than the barrel of the boiler. The wonder is, considering the cooling effect of the external air, that the paint is ever burnt off a smoke-box at all. But it is none the less likely that the temperature within frequently reaches, or perhaps exceeds, 800°, or at least 450°, more than the water within the boiler. As the draft is dependent on the exhaust, and not on the temperature of the escaping gases, as in stationary boilers, there is no reason why the temperature in the smoke-box should exceed that in the boiler. The only method of even approximately obtaining that result as yet used by engineers, consists in lengthening the tubes; but this plan is always attended with the disadvantage of rendering a smaller blast pipe—and consequently an increased back pressure—necessary to maintain the draft. It remains to be seen whether other remedies may prove more effectual.—*The Engineer.*

Collodion Balloons.

Collodion balloons may be made in the following manner: 6 grains of collodion cotton are dissolved in a mixture of 1 drachm of alcohol (sp. gr. ·835) and 2 drachms of ether (sp. gr. ·725) in a corked test tube. The solution is poured into a dry Florence flask, which is then turned about slowly, so that every part of its surface may be covered with the collodion, the excess of which is then allowed to drain back into the tube. Air is then blown into the flask through a long glass tube attached to the bellows, as long as any smell of ether is perceptible. A penknife blade is carefully inserted between the flask and the neck of the balloon, which is thus detached from the glass all round; a small piece of glass tubing is introduced for an inch or two into the neck of the balloon, so that the latter may cling round it. Through this tube air is drawn out by the mouth until half the balloon has left the side of the flask, and collapsed upon the other half. By carefully twisting the tube, the whole of the balloon may be detached and drawn out through the neck of the flask, when it must be quickly untwisted, distended by blowing through the tube, tied with a piece of silk, and suspended in the air to dry. The average weight of such balloons is two grains.

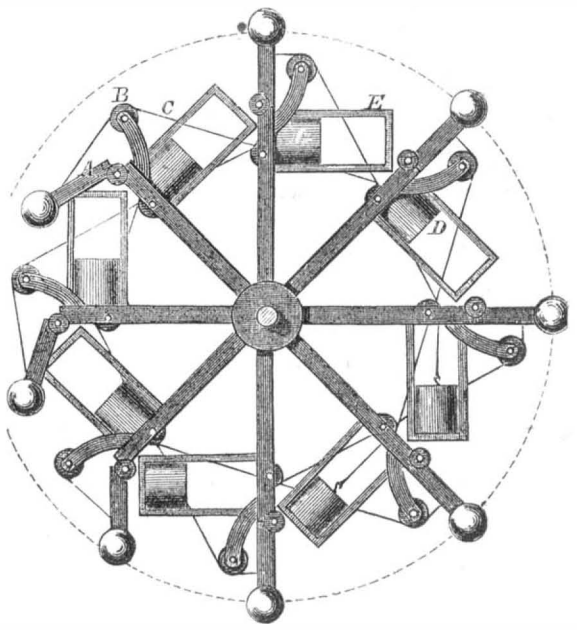
PERPETUAL MOTION.

NUMBER VIII.

The celebrated astronomer, James Ferguson, F. R. S., devised the machine illustrated in Fig. 17. It is but fair to state, however, that the machine was designed to show the fallacy of perpetual motion schemes. Ferguson never believed it would move, but maintained that its immobility was a full demonstration of the utter impossibility of a self-moving device.

The axle is placed horizontally, and the spokes turn in a vertical position. The spokes are jointed, as shown, and to each of them is fixed a frame in which a weight, D, moves. When any spoke is in a horizontal position, the weight, D, in it, falls down, and pulls the weighted arm, A, of the then vertical spoke straight out, by means of a cord, C, going over the pulley, B, to the weight, D. But when these spokes come about to the left hand, their weights fall back and cease pulling, so that the spokes then bend at their joints and the balls at their ends come nearer the center on the left side. Now, says Ferguson, "as the balls or weights at the right hand side are farther from the center than they are on the left, it might be supposed that this machine would turn round perpetually. I have shown it to many who have declared it would; and yet for all that, whoever makes it, will find it to be only a mere balance. I leave them to find out the reason."

FIG. 17.

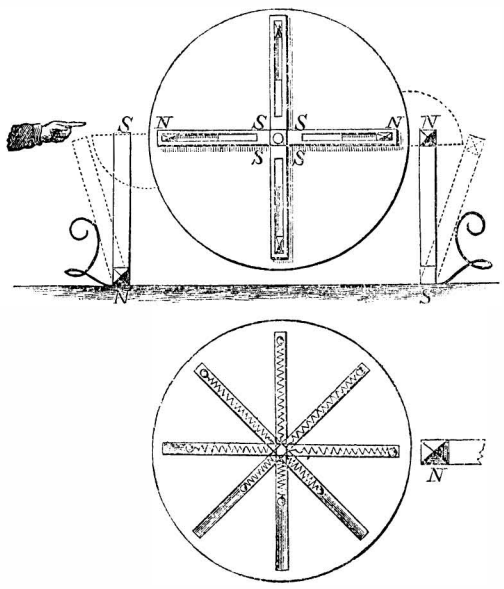


An old note informs us that "between the years 1760 and 1780, London abounded with perpetual motion seekers and their public exhibitions." Ferguson himself, a mechanician and inventor, would, no doubt, visit many of them, and would no doubt, visit many of them, and would see "schemes ingenious, curious, and specious." He did not believe it possible to produce perpetual motion by any contrivance which required the motive power to be within itself (all external agents, such as that of a never-failing stream, the ever-varying pressure of the atmosphere, etc., being ignored); yet, notwithstanding that, in 1770 he devised this plan for perpetual motion. In his "Common Place Book," we find a fine pen-and-ink drawing of his scheme, which he designates as "the most rational scheme," but at the same time declares it to be "downright nonsense." At the conclusion of it he writes: "Whoever makes it will find that it is a mere balance;" from this, it may be inferred that the machine was never made—never having had any other existence than that on paper.

W. Stephen claims our notice for drawings which he has left us of his designs for perpetual motion through applications of magnetism, and also of capillary attraction, which we can, however, only treat as early misconceptions, and offer them as a warning against pursuing similar attempts; for it is evident that if such schemes as those were capable of proving anything, the proof could only relate to the perpetuity of the agent, and not of the mechanism sought. A feather retained in a constant current of air, would prove quite as much, that is, the constancy of the current as opposed to the inconstancy of the mechanical arrangement when rendered independent of such external agency. Stephen's sketches occur on the paper lining of the backs of a small quarto, entitled "Le Machine," by G. Branca, 1629, in the English Patent Office Library, having a fly-leaf inserted on which is written, "W. Stephen's Book, March 10th, 1799.

His first figure, Fig. 18, has the following written on one side of it: "Motion by Magnetism. W. S.—*Rep: per duobus Nidem tempore quod cessit Attr: apud* ☞ *et sic aliter et de etc.*"

FIGS. 18 AND 19.



That is, the repulsion is twice through N in the same time that the attraction ceases at the ☞, and so on the contrary This notice is obscure enough, but the next, Fig. 19, marked "Magnets at the end of spiral springs," appears without comment; we can only surmise, therefore, that Stephen expected that the magnet, N, on attracting an opposite magnet, or steel bar, would overweight the wheel, and thus continually present one after the other in succession, in like manner, thereby causing a continuous rotation!

From the works of the Hon. Robert Boyle, Vol. V., page 71, we copy an historical account of a strangely self-moving liquor:

An ingenious teacher of mathematics, having occasion to make a composition for a new fire-engine, whereof he was to shew his Majesty a trial, mingled divers ingredients in an earthen pot over kindled coals; but could not or did not do it so warily, but that the matter took fire, and began to blaze furiously, which obliged him to stifle the blaze as hastily as he could; and having removed the vessel from the fire, and suffered it to grow cold, when afterwards he came to look upon it, to see if what remained might be of any use to him, he was surprised to find it variously and briskly moved. Wherefore, having set it aside, to be sure that it might be thoroughly cold, he, after some hours, visited it again, and found it move as before; and having cast store of seeds upon it, to see if the liquor would move them also, the bituminous part of it connected them into a kind of thick scum, that covered most of the superficies, but yet left some intervals, in which the liquor appeared, and discovered that it continued its motions. Two days after, the engineer discoursing with me of this fire-work, about which he had advised with me before, told me, among other things, of this odd accident. And when I asked him if the motion continued still, and had been answered affirmatively, though it was then a dark night and ill weather, my diffidence or my curiosity made me engage him to send for the pot as it was, partly to be sure of the matter of fact, and partly to try if the knowledge I had of the ingredients, which he had before told me, would afford any hint of the cause of so odd an effect; a like to which in kind, though not in degree, I had many years before devised, and successfully practiced, the way of producing.

The vessel being come, though the hasty transportation of it seemed to have sufficiently disturbed it, there did appear manifest signs of such a motion as the engineer had ascribed to it; and, therefore, he being willing to leave it with me, I caused it to be set aside in a laboratory, where some furnaces kept the air constantly warm, and did there and elsewhere, at different times, look heedfully upon it, now and then displacing or quite taking off some of the thick scum that too much covered the surface of it, and by this means I had the opportunity to take notice of several phenomena, whereof these are the chief:

1. I observed that the motion of this liquor was not only brisk, but very various, so that having loosened some small portions of the scum, one of them would be carried towards the right hand for instance, and another towards the left, at the same time. 2. Where the liquor first came out from under the scum, it seemed to move the most briskly, flowing almost like a stream whose motion upwards had been checked and, as it were, reverberated by that incumbent obstacle. 3. Several motions in this liquor were the more easy to be observed, because, though it were dark, yet it was not uniform; consisting in part of oily and bituminous ingredients, which, though they seemed to have but one common superficies with the rest of the liquor, yet, but their colors and power of vigorously reflecting the light, they were easily enough distinguishable from the rest. And I often observed that some of these unctuous portions of the matter, emerging to the surface of the liquor, though perhaps at first one of them would not appear bigger than a pin's head, yet, in moving forwards, it would at the same time diffuse itself circularly, and make, as it were, a great halo, adorned with the colors of the rainbow, and so very vivid as afforded a very

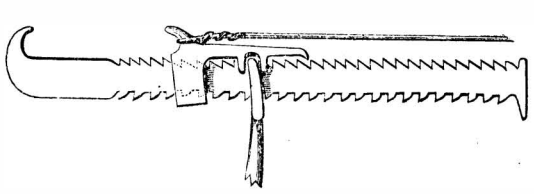
© 1871 SCIENTIFIC AMERICAN, INC

pleasant, and at first surprising spectacle; these phantasms often nimbly succeeding one another, and lasting till they lost themselves against or under the thick scum. 4. The motions of this odd liquor were not only various, but frequently vortical; to be satisfied of which, I sometimes put short bits of straw, or fragments of some such like stuff, upon the discovered part of the surface of the liquor, by which they were carried towards very distant, if not opposite, parts of the vessel at the same time. But to make the vortical motion more evident, I several times detached considerably large pieces of the thick scum from the rest of the body, and had the pleasure to see them move both with a progressive motion in crooked lines, and with a motion about their own middlemost parts. All this while, the liquor, whose parts were thus briskly moved, was actually cold, as to sense. 5. To observe what the presence, or absence, of the free air would do to this liquor, I caused many spoonfuls of it, with some of the scum, to be put into a cylindrical glass, which, though large itself, had a neck belonging to it, that was but about the bigness of one's thumb, that it might be well stopped with a cork. But having, by this means, kept the free air from having a full and immediate contact with the whole surface of the mixture, as it had when that mixture lay in the wide-mouthed vessel, I could not perceive the liquor to move to and fro, no, not though the orifice of the neck were left open; whereas, having, at the same time, poured some of the liquor into a very shallow and wide-mouthed vessel, called in the shops a clear-caked glass, it moved rather more than less nimbly and variously than in the great earthen pot (which yet was of the same shape), and shewed us many of those vivid and self-dilating circles that have been mentioned in the third number; and these, by the fineness of their colours and the quickness wherewith they succeeded one another, afforded a delightful spectacle as long as I stayed to observe the liquor. 6. Though the motions of the hitherto mentioned liquor did not seem to be always equally brisk, yet they appeared to continue manifest and various in some diversities of weather, as to cold and heat, and when I looked on it by candle-light as well as by daylight; and when, not being well enough to visit it myself, I sent one purposely to look upon it, about ten o'clock at night, he brought me word that it continued to move as formerly, and so it has done for ten days; and how much longer it will continue to do so, time must determine.

POSTSCRIPT.—Some time after the foregoing account had been written, when I came to look upon the liquor (which in the mean time had been several times viewed, and appeared to retain its motions), I found, to my trouble, that somebody's impertinent curiosity and heedlessness had cracked the lower part of the earthen pot; at which overture, the liquor, though not the scum, was run out; which had put a period to our observations, but that, foreseeing that such an accident might happen, I had long before taken out some spoonfuls of the liquor, and kept it close stopped in a vial. By this means I had the opportunity to observe that, when I poured out the liquor into a wide-mouthed vessel, it would move as before, though this were done some weeks after it had been put up. And I remember that long after, having one day received the honour of a visit from a foreign minister, who was an inquisitive person and a man of letters, we chanced, among other things, to talk of the liquor; and though it were scarce to be hoped that it could retain any of its motive virtue, yet, to gratify his curiosity, and that of some ingenious men there present, I caused the vial to be brought, and having unstopped it, I poured out the liquor into a convenient-shaped vessel, in which, after we had suffered it to rest awhile, they were delightfully surprised to see it move (though not, in my opinion, quite so briskly as before), yet very manifestly and variously. This encouraged me to think it possible that it might retain some motion, though but languid, seven or eight weeks after; and therefore, on the 25th of July, I looked upon it again, and having caused it to be poured into a china cup, it manifested, at first, a brisk and various motion; but this, after awhile, did so slacken that I began to have some suspicion that the motion it was put into by effusion and the first contact of the air might have given it the greatest part of its agitation. But this being but suspicion, I put the vessel into divers postures in a window, the better to discover the true cause of this phenomenon; but whilst I was busy about this, which ingrossed my attention, a mischance overturned the cup, and, by throwing down the liquor, put an end to my speculation; yet this mischance hindered me but from observing how long the odd agitation of our liquor would have continued, but not from finding that it lasted a great while; for I shewed it to the foreign minister about or after the beginning of June, that is, about five months or more after the liquor was first observed to move.

WIRE STRETCHER FOR FENCE BUILDING.

Much difficulty has been experienced in making wire trellises, vine frames, fences, etc., in properly stretching the wire. The simple instrument illustrated herewith, and which

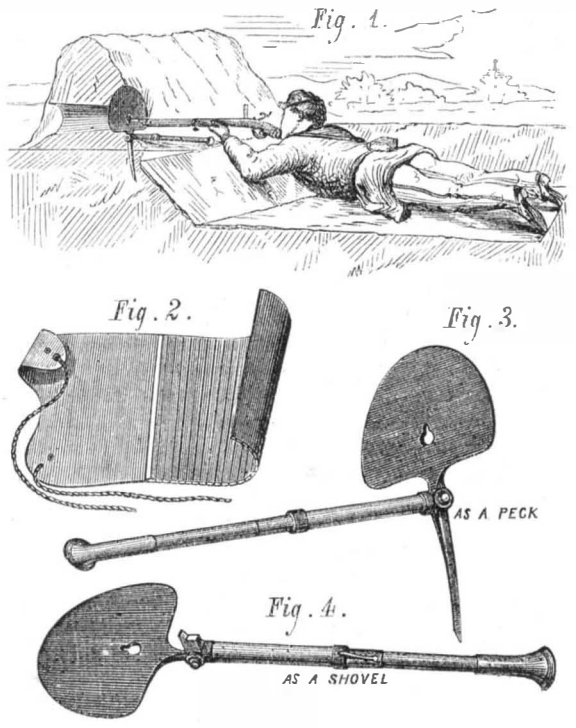


was invented and patented by William B. Hayden, of Columbus, Ohio, seems well adapted to this purpose. It consists of a hooked ratchet bar combined with a hooked sliding pawl, adapted to receive a hand lever by which it is worked, and by which the two hooks engaging the wire loops are made to approach and tighten the wire.

INTRENCHING TOOL.

The tools which we now notice are the result of the growing improvement in musketry fire, and the consequent imperative demand for shelter, The new edition of the "Drill Book" contains provisions for the formation of such shelter pits and trenches, but no regular tools for general use are yet decided upon.

Captain A. Stewart Harrison, First London Engineers, has devised a combined spade and pick, which we illustrate in the annexed engraving (Fig. 4). It will be seen that the pick

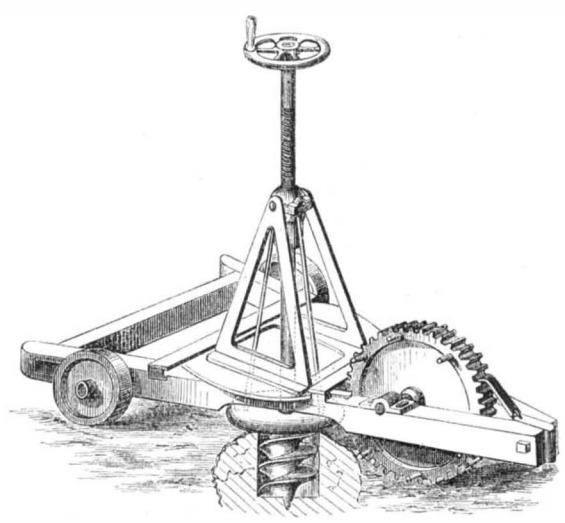


and spade are hinged at their junction, so that when the spade is in use the pick lies close to the handle of the tool, surrounded and secured by a telescope sheath. When the pick is to be used it is turned on the hinge till it and the spade are at right angles to the handle, in which position it is also secured by the telescopic sheath. The tool is also intended to serve as a mantlet in combination with the earth thrown up. This use is illustrated by Fig. 1.

Embrasures are prepared in the earthwork by building up in it, funnels made by rolling up the combined structure of wood strips and cloth, shown in Fig. 2, or made up of telescopic sections of zinc or thin iron, like a pocket drinking cup without a bottom. In rear of this funnel or embrasure is placed the spade, the pick being thrust into the ground. The spade is pierced with a circular hole, through which to fire, and, in fact, it plays on a small scale the part which the large iron-plated shields are intended to play at Gibraltar, Portsmouth, and elsewhere.—*Condensed from The Engineer.*

POST-HOLE BORER.

In boring post holes by the ordinary hand-boring tool, they are apt to be sunk obliquely. In spacing the holes a measuring rod or tape-line is also necessary. The machine here-



with illustrated is intended to facilitate the spacing, and to secure the vertical descent of the auger. To this end the auger is made to keep its relative position with the surface by means of a strong guiding frame, fixed to the triangular frame of a carriage. The carriage is provided with a measuring wheel, which indicates the distance the carriage has rolled upon the surface, and thus secures uniformity in the spacing. Patented September, 1868, by A. F. Summers, of Peoria, Ill.

Ten Thousand Mill Hands in Fall River.

"We'll Try," is the motto of the corporate seal of the City of Fall River, Massachusetts. The people have tried, and here are the figures of the new year, to show what they have accomplished. The factories represent a capital of $6,740,000, with 552,237 spindles, employ nearly 10,000 hands, and turn off about 133,000,000 yards of cloth per annum, while nearly all the territory within the city limits is thickly covered with tenements and a more elegant class of residences, the latter of which are chiefly in the northern portion of the city. The pioneers in the movement were Colonel Richard Borden and Bradford Durfee, the former of whom is still living, who many years since begun business with a limited capital in the Fall River Iron Company, and by industry and good management, they were enabled in the course of time, to begin the manufacture of "prints" in the establishments now bearing their names.

One element of success which has marked the city has been that its manufacturers, instead of investing their profits in other securities, have used them in increasing their manufactories, and the same holds true as to other business, and the immense capital which is wielded is strictly within the hands of the citizens. They have at various times met with reverses, in the way of conflagrations and strikes, but upon recovering from them, increased prosperity has been the result.

During the coming spring the Granite Company will construct a new building of stone, which will set in operation 40,000 spindles, and give employment to 400 people; the Durfee Company will build a similar building, for the same number of spindles; the Stafford Company one of 30,000 spindles, employing 300 people; the Merchants', an extension of 27,000 spindles; and the Wetamore Mills, of recent origin, construct a building of brick, just north of the Mechanics' Mill, with 25,000 spindles, giving employment to nearly 300.

Antiquity of Pulpits.

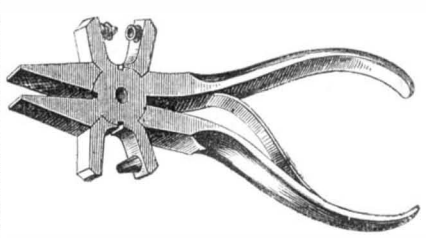
The solemn reading of the law of Moses to the populace of Jerusalem must have been an impressive service, when "Ezra the scribe stood upon a pulpit of wood which they had made for the purpose." As to its configuration we are not informed, though it must have been a spacious raised platform if the six persons named on one side of Ezra and the seven on the other were also upon it. Stone pulpits existed in some cathedrals, churches, and monastic refectories, and one of iron is stated to be in the "Galilee" at Durham. Entries at Exeter, 1318–25, relate to materials "*pro la pulpytte*," but that was a distinct building on the north side of the church, for lectures and sermons. Capitals and bases for the ambos at Westminster were paid for in 1352. Preaching appears to have been a part of religious services from the earliest ages of the church; and the sermons were commonly delivered in the chancel in front of the altar. At a later time they were addressed from the ambo, or reading-desk, in the nave, an innovation assigned to Chrysostom at Constantinople. In some churches the preacher used to sit and the congregation to stand, and generally the lecture was more of the extempore kind than now prevails. The orderly conduct of a modern congregation arises from the discipline of ages, having succeeded, by gradual process, habits of comparatively little decorum, and the open expression of opinion on the merits of the preacher's discourse. The rarity of wooden pulpits of earlier date than the Reformation, is no doubt principally attributable to the sweeping clearance of church fittings pursuant of that event, just as with altars, and roods, and screens. Yet they, one and all, are met with in modern Papal churches, where the presence of either can scarcely be due to the Reformation.

Liquorice.

Liquorice is a native of the south of Europe, and appears to have been cultivated in England since the time of Elizabeth. The chief places where it was long reared in any quantity for sale were Pontefract, in Yorkshire; Worksop, in Nottinghamshire; and Godalming, in Surrey. It is now, however, raised by many gardeners in the vicinity of London, by which the London market is supplied with roots in no respect inferior to those of warmer climates. It requires a deep sandy loam, trenched by the spade or plow to two feet or three feet deep, and manured if necessary. The plants are procured from old plantations, and consist of those side roots which have eyes or buds. The planting season is either October or February and March; the latter is preferable. The plants are dibbled in, in rows three feet apart. The plants do not rise above one foot the first season, and take three years before the root is fit for use. Decoctions of this root yield an extract containing a large quantity of saccharine matter and mucilage, with a little bitter extract. It is used in medicine under various forms, and is the black sugar or Spanish juice, so generally known. The liquorice roots are also used by brewers, to a considerable extent, in the manufacture of porter. Liquorice juice has been famed since the days of Hippocrates as useful in allaying thirst. Dr. Cullen supposes, however, that this property does not actually belong to the saccharine juice; but that if a piece of the root be chewed till all this juice is extracted, there remains a bitter which acts on the salivary glands, and this may contribute to remove thirst.

SHORMAKER'S TOOL.

A very handy tool, of which the accompanying engraving



is a representation, is designed by the inventor, Mr. William T, Fisher, of Rome County, Tenn., for shoemakers' use. As will be seen it is a pair of pinchers or pliers having six instead of two jaws, all pivoted upon a single pivot, as shown, the extra jaws being provided with dies and punches for cutting holes for shoe strings and inserting eyelets therein

© 1871 SCIENTIFIC AMERICAN, INC

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

The Law Applicable to Rejected Cases.

MESSRS. EDITORS:—On behalf of many oppressed inventors allow me through your excellent paper to suggest briefly how the present or new patent law may be construed so as to be consistent with itself and with justice, and also do honor to the Patent Office which is now in a muddle.

The meaning of the thirty-fifth section of the law depends upon the meaning given to the word "rejected," as used therein. But this section is construed and limited by a promise in section three, which says: "Provided also that all applications for patents pending at the time of the pasage of this act, in cases where the duty has been paid, shall be proceeded with and acted on in the same manner as though filed after the passage thereof."

Now this promise covers all applications pending July 8, 1870, though such cases were also partially but not finally rejected, whether one claim out of forty had been rejected, or the whole case once or twice rejected by the primary examiner, or even rejected on appeal to the Board of Examiners-in-Chief, or to the Commissioner in person, provided the limit of appeal to court had not expired. All such cases were pending, though partly rejected, and they are not affected by sec. thirty-five. Thus the word "rejected" in sec. thirty-five most be limited to cases finally rejected and needing a special law to revive them.

The official decision of September 21, 1870, is correct in requiring a case to be amended or put in form for the next official action. But the proposed renewal, upon which the decision is made, is in itself an erroneous assumption, both by the applicant and the office. No renewal was required, for the case was not finally rejected. It was only partially rejected, and was yet a pending case, and could be prosecuted as such under sec. three of the law.

If the present official construction of the law be enforced, the rights of an inventor may be declared abandoned by only six months delay, a result too monstrous to be supposed in view of sec. thirty-two of the law and the time-honored right of two years prior to abandonment.

Therefore in my opinion the law as it now stands may be so construed as to be consistent with itself and with justice to all parties. Sec. one hundred and eleven protects all pending cases not fatally and finally rejected, and sec. thirty-five applies only to cases forfeited, withdrawn, finally rejected, or otherwise requiring revival under a special law.

DR. DANIEL BREED.

I have no doubt that the intention of the act of July 8, 1870, was, that after any action by the office, two full years should be allowed to the applicant to prepare for further action before his case was abandoned. CHAS. MASON.

[We have no doubt that whenever this question is adjudicated by the courts the judgment will be in conformity to the views above expressed.—EDS.

Inspection of Stokers.

MESSRS. EDITORS:—In your article headed "Testing the Strength of Boilers by Steam Pressure," you alluded to an article of your Boston correspondent on the "Prohibition of Unsafe Boilers," and think he "might find a text for a sermon on the prohibition of ignorance and stupidity in those who are allowed to have anything to do with boilers or engines," and you conclude by giving a practical suggestion recommending a law appointing competent inspectors to examine not only the boilers, but the persons in charge of them, etc.

Now, Messrs. Editors, high as your Boston correspondent values your opinions on all scientific subjects, he is far from agreeing with your opinion as expressed in the article alluded to. He has no confidence in legislation on such subjects. He would not, if asked, name the boiler or even the species of boilers that should be termed safe and by law forced upon the users. He does not believe that competent inspectors can be appointed by any known legislative process. He does not believe in any test for competence prescribed by law. Nor does he believe it possible to lay down a rule applicable to all cases which would prevent steam boiler explosions. Vigilance, coolness, and a realization of the great responsibility assumed by the engine tender are the necessary qualities to insure safety in the use of steam with the old style of tank boiler. But where is the security? Temperance and knowledge are valuable in a fireman, but no security against accidents, nor will better pay insure better men. A common-school education is desirable in a fireman or engine tender, but not even a classical education would be a security against explosions. In truth there is no sure test of competence, and so-called competent men are generally the most reckless.

Your Boston correspondent: recognizing the fact that we have as yet scarcely commenced the use of steam for general purposes, knowing how nearly all of our public institutions are built over a volcano, controlled by a genie who may at any time get gin-y and hurl the whole fabric, be it court or school-house, church or bank, into the air, and dear valuable human beings into eternity; labors, and has for years labored, to make the use of steam as safe and harmless as possible, and to place the possibility of explosions beyond chance or accident. He wishes to impress all steam users with the conviction that, to use a boiler which, by ignorance, stupidity, or carelessness, or even by design, can be exploded, and kill and maim innocent persons, is a crime. He does not recommend any particular kind of boiler, but believes the introduction of safe boilers will elevate the standard of the men attending them, for the more perfect the machine the more intelligence will be required to attend the same. It must be remembered that carelessness or ignorance are far less compatible with the use of safe than with tank boilers, and the only difference is that in the one the penalty is stoppage and repairs, with plain and evident proof of carelessness, whereas in the other the result is generally a coroner's verdict of "no one to blame." BOSTON.

Why Mainsprings Break.

MESSRS. EDITORS:—Having read in your valuable paper Mr. R. Cowles' remarks under the heading, "Popular Errors regarding the Watch," I became interested. Having had twenty years' experience in watchmaking, I agree with Mr. Cowles, excepting the breakage of mainsprings. In almost every instance where a spring breaks, a cause may be found, if the spring be carefully examined. Such has been my experience, at least, although I have seen springs broken without apparent cause, unless we charge it to high and uneven temper in the springs. A very large percentage of breakage is caused, I think, by handling the springs with moist hands, while cleaning and oiling, and placing the same in the barrel, as Mr. M. D. Kelly, of Cadiz, Ky., has very truthfully said in his remarks in your issue of Nov. 19th, 1870. He also says he has adopted a mainspring winder of his own invention, by the use of which a spring need not be touched with the fingers after it is cleaned and oiled ready for the barrel. The twisting of the spring out of a true circle in order to place the same in a barrel with the fingers is undoubtedly the cause of many breakages, and if Mr. Kelly's tool is what he claims for it, it is certainly valuable, and one long needed.

During twelve years that I followed my trade in Minnesota, experience taught me that I had four broken springs in cold weather to one in warm weather. I have frequently taken my watches from the window in severe cold weather, to save breakages.

Another cause, and one which I believe to be quite common, is, that in cleaning or oiling the spring, the watchmaker takes hold of the outer end of the spring with thumb and forefinger, while with the other hand he takes a chamois skin, or a piece of paper, and runs along to the center of the spring, at the same time straightening the spring at full length; he proceeds the same way in oiling, and this operation is the cause of many breakages.

I do not uncoil the spring, but place a narrow strip of chamois skin around it, and take hold of it at the side, with thumb and forefinger, holding it tight, and running it around the coils to the center and back; and then proceed to oil the spring in the same way, after placing a drop of oil on a clean piece of chamois skin; I thereby avoid a severe strain to the spring by bending it in opposite directions, as is too often done. I then place it in the barrel clean and free from dust. With Mr. Kelly's mainspring winder nine out of ten springs, which would otherwise be broken will, I believe, remain sound.

Great care must be taken to keep springs clean and dry from the perspiration of the hands. With all due deference to Mr. Henry Holinshed, Jr., of Camden, N. J., in his comments on the mainspring, in your issue of Dec. 10, 1870, I must still take some exceptions. He says when a mainspring is taken out in cleaning a watch and is handled by the watchmaker, that the warmth of the hands expands the spring to such an extent that in placing it in the watch and winding it up to its full power, the spring then, being in an expanded state and wound tight around the arbor, the contraction will be so great as to cause the spring to break. His hands must be very hot or his philosophy will not hold good. To prove his reasoning correct, he says one wishing to test it can do so by heating a piece of spring and fastening it at both ends at full length, and it will certainly break. This last cannot be doubted if the spring be heated red hot, but it will not break when heated to blood heat. I wish, for experiment's sake, he would hold a spring in his hand for 24 hours, and then fasten both ends at full length, and let us know when it breaks. LAUREN CARPENTER.

St. Joseph, Mich.

Solar Motive Force.

MESSRS. EDITORS:—The attention of inventors is directed to this field by the proposition of Ericsson to develop an engine to act from direct sunlight.

There are several typical ways of securing a useful motive power from sunlight, and their practical utility depends on their economy and adaptability.

1. The use of sunlight direct. This is that which Ericsson proposes to employ. It involves the use of an engine and of a concentrating apparatus; and has its limitations in the cost of construction and the care and expense of keeping in order, with the limitation of power in specific spaces, and confinement to the time of sunshine, etc.

2. Use of the variations of heat between day and night. This has less limitations, but still requires a costly engine of considerable magnitude.

3. Use of sunlight through organic products. This may be either by burning, as in steam power, where the whole product (recent or fossil) is used, to gain a small per cent of the force, or by use of a small proportion of the product, as animal food, to produce animal force, gaining a high per cent of power from the part so used as food. This involves the use of a large and suitable surface of soil, with labor and preparation long before use, and requires costly engines; that is, animals. But it has the advantage of complete control over the amount of power desired, and the time and place of its employment. It is the mode by which the greater portion of motive power is secured, the natural result of its controllable availability.

4. The cheapest and most simple of all the modes of procuring motive power from sunlight continually thrown upon the earth is to take advantage of the masses of matter set in motion by it; namely, wind and of water. Both are entirely practical, and easily made available. They have been in use from the earliest times, and admit of great concentration for use.

Water powers are more limited in position, but more regular and controllable; are suited to great and small works, and are of great practical value.

Wind powers are cheap, simple, and nearly everywhere available; not limited to sunshine, although limited by their variability. They are a mode of power of great use and value. But they yet lack much to make their use suit the American mind.

It is probable that wind power is a more worthy field for high inventive talent than "sun engines," viewed in any practical light whatever. S. J. WALLACE.

Keokuk, Iowa.

Man Not Made of Clay.

MESSRS. EDITORS:—In the third lecture of Dr. Doremus, before the Young Men's Christian Association, as published in the SCIENTIFIC AMERICAN of January 1, current volume, while discoursing on the properties of clay, the learned doctor says: "In the Bible it was stated that men were made of clay; but it might be said in passing that the metal which formed the basis of that substance was almost the only one not found by chemists in the human frame. Doubtless the Biblical reading ought to be earth."

The doctor here has made a grave mistake, which, for the cause of truth, I think ought to be corrected. The Bible nowhere states that men were made of clay. The history of creation as contained in the Book of Genesis informs us that one man, Adam, was formed of dust—see Genesis, chap. 2-7: "And the Lord God formed man of the dust of the ground and breathed into his nostrils the breath of life; and man became a living soul." Again, chap. 3-19: "In the sweat of thy face shalt thou eat bread, till thou return unto the ground; for out of it wast thou taken; for dust thou art and unto dust shalt thou return." Gen., chap. 2-19: "And out of the ground the Lord God formed every beast of the field and every fowl of the air."

The word clay is not found in connection with the history of creation, either of man or beast; no need therefore in this case for a new translation in order to reconcile God with science.

As this lecture was particularly addressed to a very respectable Christian association, and will doubtless be widely published, it is due to Christianity that the Doctor's mistake be publicly corrected. EDWARD SELLON.

Galva, Ill.

A Fine Testimonial.

MESSRS. EDITORS:—Inclosed please find the names of fifty-three subscribers, together with $132·50, the amount of their subscriptions.

I started for a club of ten, but that was obtained in almost an hour. I thought that I might work it up to two clubs. I did so easily; went for another. I got that, and so on, until I have got five clubs and over. I think I could get more if I had the time.

Although I have had your paper for the last ten or fifteen years, it has for the past year been more appreciated by all the members of the family than heretofore. My wife reads it as much as I do, and with as much relish as myself, and my boy, only six years old, got so much interested in it that on Thursdays, when I come home with your paper in my hand, he would ask: "Pa, is that the SCIENTIFIC AMERICAN?" "Yes," I would say. "Come," he would say, his eyes brightening up, "read to me and tell me all about the bugs." For him I will say, "don't forget the 'bugs' another year."

Ilion, N. Y. GEO. S. KNIGHT.

Men of Progress.

MESSRS. EDITORS:—The engraving came through all right, for which please accept my thanks. I am amply repaid for the pains I have taken to keep my club alive during the past ten years.

The picture is a beautiful one, and much admired by all who have seen it here. I should have placed Ericsson in the foreground with a *Monitor* near him. What an immense amount of destruction the rebel *Merrimac* would have done had it not met the stripling with his sling. So I say, all honor to the inventor of the *Monitor*, and, though a foreigner, we might well adopt him as a true American inventor.

Haverhill, Mass. N. SPOFFORD.

[We shall still continue to give this superb work of art to all those who send us a club of ten subscribers.—EDS.

Rain-water Cistern.

MESSRS. EDITORS:—There is no better filter for a rain-water cistern than a well of soft-burned bricks built up within it. I have one twenty inches square in the center of my cistern, from which the pump draws. It may be built in one corner as well. The water percolates through the substance of the bricks, which detain every impurity, except such as are chemically united with the water.

ENGINEERING IN INDIA.—The Anglo-Indian Government is now spending upon public works $38,500,000 a year, a sum rather in excess of the entire revenue of Belgium. It is found that officers of the royal engineers are not altogether suitable for India, and the Duke of Argyll, Secretary for India, has now established a special college to turn out the article required. It will be remembered that not long since the Government of India called in the assistance of American engineers whose experience in rough-and-ready, yet difficult work, was thought to be that most needed in India.

© 1871 SCIENTIFIC AMERICAN, INC

Special Correspondence of the Scientific American.

AN IDLE DAY AT FALL RIVER, MASS.

Leaving New York in the afternoon on board one of the magnificent steamers for Boston, I arrived about five o'clock next morning at Fall River. Startled by the barbarous sound of a gong from a feverish sleep on a cold winter morning, I felt for some time undecided whether to rise and continue my journey on the early train for Boston, or wait for a later train. After a careful canvass, the bed seemed to have a majority of votes, and I turned over for another two hours sleep regardless of gong, knocking at the doors, and all other appeals. I heard at last the bell of the locomotive and the rapidly increasing puffs of the exhaust told me the train was off.

I expected to sleep, but was rudely disappointed, for no sooner had the train left than it seemed a thousand fiends had been set loose. What with the blowing off of boilers, the hurrying forward and backward of, it seemed, hundreds of trucks, the shouts of human voices and the shrieking of locomotive whistles, sleep was impossible, and after several vain attempts, I rose, and having plenty of time, started to see how a manufacturing city looks on a gray, cold, wintery morning.

Fall River is so situated that the casual traveler through it, particularly in the early morning, could never suspect it of being the American Manchester. The depot, alongside of which the steamers land, is situated in one corner of the city, and under the hill on which it was built; and the railroad on the same level skirts only the edge, and soon leaves Fall River in its rear. The only signs of life at this hour are the columns of smoke issuing from a number of tall chimneys, where the giants, who are expected to do all the heavy work the day, have already commenced their morning meals. The first objects in sight, on leaving the depot, are the magnificent buildings of the "American Print Works." Nothing in this country or in Europe surpasses them in simplicity and purity of design, nor in the massive durability of their construction. I have seen and duly admired the celebrated works at Mulhouse, in France, as well as the magnificent works of Sir Titus Salt, at Saltaire, in England, yet neither can compare with the American Print Works in design or construction.

Crossing a pond of water on a long wooden bridge, I had before me the extensive works of the "American Linen Company," which is used as a cotton mill. It is one of the largest in Fall River, running 82,500 spindles, 2,000 looms, employing 1,200 hands, and manufacturing twenty millions yards of cloth per year. Five powerful engines, 32 inches by 5 feet stroke, drive the machinery, and over 7,000 tuns of coal per annum are consumed in the furnaces of their sixteen boilers. Turning up the hill on which Fall River is situated, we pass one mill after another, all built in the most substantial manner, out of native granite. In fact, everything is solid and substantial. Even the inhabitants partake of this solidity; for we believe that the original settlers averaged more in hight and weight than those of any other place we are acquainted with.

No casual observer could believe that Fall River is built along the course of a stream—first, because it is built on a steep hill, or bluff; and second, because no water course is in sight. The original name of the stream was "Quequechan," and it is the outlet of Watuppa Pond. This stream has a fall of 130 feet, in less than 2,500 feet horizontal measurement, and most of the mills are built over it, so that the water is used, over and over, to give the power required. Most of the new mills are built regardless of the stream, and run entirely by steam; yet, until the erection of the last—the Mechanics' Mill—were built on the high level, near the pond.

In 1860, Fall River produced 45,225,000 yards of cloth, and consumed 10,167,000 pounds of cotton. Last year the production was 132,865,000 yards, consuming 25,253,000 pounds of cotton; an increase of nearly two hundred per cent in ten years. Organizations have been perfected for the erection this year of five new mills, averaging 30,000 spindles each. With these additions, Fall River will contain twenty-six first-class cotton mills, running over 700,000 spindles. When we add to these the large print works, iron-rolling mill, founderies, machine shops, and other incidental works, an idea may be formed of the future of this great beehive of American industry. Yet the whole of the present city may be said to have been built since 1843, for in that year nearly the whole was destroyed by fire.

Nearly all the mills are owned in Fall River, and are under the personal management of the owners. They have adopted the motto, "We'll Try," for the city seal, and carry this sentiment into every department of their works. They are young, and have their history to make, and are working with energy and judgment to make it the proudest of all manufacturing cities. The location is healthy, and the harbor deep and secure—being part of the beautiful Narragansett Bay—and they are, for all practical purposes, as near New York as Brooklyn or Jersey City.

Concluding that an idle day might be profitably spent in this place, I retraced my steps down the hill to the front door of the American Print Works. In the tower, which forms the vestibule, I found a doorkeeper such as it would be difficult to duplicate. He was neither polite nor rude. Like the solid granite of the tower, he was emphatically the right man in the right place. He knew his duty, and he did it. "Go to the office and get a ticket, and you can go in." I went and got the ticket, and got in; and when in, to my great delight, found myself at liberty to go where I chose. Whenever I found myself "cornered," I found a ready answer to my questions, short and to the point; and, although I frequently lost myself in a labyrinth of courts, rooms, and passages, with occasional assistance I found my way through all but the blind regions of the dye-house, where any one used to London fogs would be unable to get about, unless accustomed to its queer ways. And here let me call the attention of the readers of the SCIENTIFIC AMERICAN, who have any theory on the subject of ventilation, to the fact that a dye-house is the place to experiment, and either establish the truth or fallacy of their theory. No place needs ventilation more, nor is there a more profitable field open for the application of ventilating appliances. Having made myself familiar with the Works, I will now lead the reader through it, and explain to him the different manipulations.

This establishment was started some thirty-six years ago, and has, during that time, established for itself an enviable reputation. There is not a family in the whole of this broad land that is not aware of the excellence of the goods sold as American prints; and whether we enter the palatial stores on Broadway, New York, or the little roadside store on our frontiers, the prints of the American Print Works are certain to be the admiration of the lady customers. Yet these works passed through a fiery ordeal on Sunday, December 15, 1867, on which day they caught fire from some unknown cause, and nearly the whole establishment, with two new wings, just completed, was destroyed, involving a loss of nearly two million dollars. On Monday morning over three hundred men were at work clearing away the rubbish; and, as rapidly as a corner were cleared to the foundation, the erection of the present stately edifice were commenced. In sixteen months from the date of the fire, the whole of this immense pile was, not only completed, but filled with machinery.

It is perfectly marvelous to examine the whole of this establishment in all its multitude of details, and find that, no matter how insignificant in itself, a practical and inventive mind has carefully studied every part. Whether the visitor be an engineer, architect, founderyman, or carpenter, he will continually find details new in themselves, and most happily applied. To a calico printer, the works are a marvel of compactness. Much credit is due to the designer of the establishment as well as to the capitalist, who, confiding in his sound judgment, left him free to carry out his designs. The whole of the works, with all the ells and wings, present a frontage of 2,055 feet of solid granite masonry, built after the most appropriate architectural design, giving at a glance the impression that money was neither stinted nor wasted in its erection.

Entering the tower with the magic ticket, I ascended the massive stairs to the top of the building, and found myself in a large "hanging-room," where damp cloth is air dried before being used. On the north end of this floor is the "designing room." A tap at the door, a cheerful "come in," and I open the door to behold a room about forty feet wide by eighty feet in length. Before each window is a peculiar kind of desk, and at each desk a gentleman and an artist sits engaged on some new design to be printed on calico.

This designing is a peculiar art, and requires a good deal of taste and judgment, particularly those designs which cover breadth: for, besides the production of original figures in which the colors are harmoniously blended, they must be so arranged that different breadths will easily fit the figures without waste, and, yet so that particular designs may not "run"—that is, not form continuous lines, but be lost as often as possible, to avoid geometrical forms, which give an appearance of stiffness to the design. A peculiar feature in this room is the extensive library of designs pasted into large books, and filling one whole side of the room. It contains samples of prints of all countries. One of the cases contains all the samples of prints designed in their works—very curious to examine. The first book contains many curious patterns, printed partly on rolls and partly blocked in by hand; some have only one or two colors painted in by hand. An idea may be formed of the progress made in this kind of work when we state that it took six years to fill the first book of samples, and that the last book was filled in nine months. After the design is completed and approved, it is enlarged nine times in the "dark room" on the principle of the magic lantern. The design being placed on a glass plate throws a shadow on a table nine times as far below the glass as the light is above, and the outlines being traced, the design is finished more accurately with ink, and the different colors separately drawn. The next step is the engraving of the rolls; this is done by ladies in the pentagraph room. Hundreds of the most skilled engravers would be required to do the work which is here accomplished by ten machines, each conducted by a lady, who, tracing the design, operates a number of diamonds, which trace the design reduced one tenth in size on the copper rolls. The finely-built machines, the highly-polished copper rolls, and pretty women, make this room very attractive for visitors, but dangerous for bachelors. Even I, although not a bachelor, lingered longer over the designs in this room than in the designing room, where they were more brilliant in color. Most of the designs have a groundwork of lines which is traced by a separate machine, and is always at an angle with the axis of the roll; this is done to prevent the "doctor," or scraper, from entering into them when in the machine.

The printing room is, although not the largest, the finest and best arranged in the world. It has room for twenty machines, sixteen of which are in constant use. This floor is eighty feet deep, part of which is taken up by the "hot rooms." It is magnificently lighted, both by the large windows on the first floor and by those of the second story through a large opening, surrounded by a handsome railing.

The newly-printed goods, instead of, as usual, passing directly into the hot room, pass over a series of flat steam chests, where a large amount of moisture is evaporated, and the color is set in an atmosphere more fully charged with oxygen than that of the hot room. There is obtained in this way a more perfect oxidation of the mineral colors, and consequently a more brilliant effect. This room is the admiration of all printers that visit the works, and the printers attending the machines are a fair type of American mechanics.

The kier room, with its fourteen kiers and washing machines, are worth a visit. All the kiers are high pressure, and work on the Barlow principle. Two of these have been lately changed, and are now worked separate on an entirely new principle by which the time of bleaching is reduced one third, and the goods are much better than those made in England. This is an American invention, and is applicable to all kinds of kiers.

After the goods have passed through numerous processes they reach the folding room, in which they pass first through a number of "conditioning" or "damping frames." They pass, for the last time, through the drying machines, which here perform the same office as the mangle in domestic laundries; they are then ready to be folded. This, although it seems simple, is a difficult operation, for the goods must be all folded exactly one yard to the fold, and also the edge must be kept perfectly even. Many print works fold by hand, and as women and girls are employed, it is really a barbarous kind of work, involving physical exertion more laborious than should be performed by a woman. Thanks to American ingenuity, folding machines are now made so perfect that the women have only to guide the cloth, and all the hand labor is performed by the machine.

The present works are built as nearly as possible fire-proof. All the wings and buildings are built entirely surrounded by heavy walls, and all communications can be instantly closed by two iron doors to each opening. A great number of fire escapes are erected on the outside, communicating with all the floors, and all parts of the works. On each floor are also two fire plugs placed on the balconies of the fire escapes, two of the largest size duplex steam pumps are placed in the fire-pump room, and all kinds of apparatus that may be required are placed ready, and kept in perfect order for instant use. There are also large force pumps attached to a 40-horse power water wheel, which can be started, should steam chance to be wanting. Sixty powerful streams of water can thus at any time be thrown on different parts of the works. No engineer should neglect to examine the boiler house, the best arranged in America. It contains twenty-two boilers in constant operation. The whole arrangement is perfect itself. The boilers are each fitted with gongs, etc., the same as those used on the boilers of the Beach Pneumatic Transit Co. under Broadway, while the partitions between the boilers, instead of being built of brick-work, are composed of tubes in which water is made to circulate. The foreman assured us that no matter how suddenly the works will draw upon steam, which in print works is at times nearly all that can be supplied, in ten minutes he can recover the pressure by opening the draft.

Speaking of draft, brings me again to the chimney which first arrested my attention in the morning. This chimney is the finest in America, when harmonious architectural effect is considered. It is built on new, but well-tested principles, the invention of a well-known American engineer, who has built a number of them in the Eastern States. It insures an equal draft by maintaining a uniform temperature. This is accomplished by a hot chamber, not unlike the Siemen's regenerators. The friction is also diminished as much as possible by the form of the flues An attempt was recently made to place an automatic damper in this chimney, which it seems was not evenly balanced; on closing the flue it tore away from its fastenings. Thus released it commenced turning with great velocity. All attempts to grasp it with large pipe tongs proved unavailing, and only the opening of the large door in the chimney could stop it.

It is a matter of congratulation that scientific engineers are taking hold of the erection of factory chimneys, for there are few things which cause so much annoyance, and interfere so much with the proper success of technical operations as poor chimneys, not to speak of the waste of fuel attending their use.

Having spent so much pleasant and profitable time in the works, I passed again through the tower, and bidding the brusque door-keeper good-afternoon, reluctantly started for the Old Colony railroad station in time for the 3:40 P.M. train for Boston. The last sight that met my eyes as I left the station was the smoke gracefully floating from the top of the chimney one hundred and thirty feet from the ground, as I whirled along the shore of the now ice-bound Mont Hope Bay, a part of which was in sight until I reached Taunton.

Sawdust in the Smith-Shop.

A correspondent of the *Coachmaker's Magazine* writes:

"Sawdust is a grease neutralizer, and annihilator, and a file saver. No well-regulated smith shop should be without a well-filled box of sawdust at each drilling machine. The box should be large enough to place the rim, when it is drilled, inside. Give the iron a thorough rubbing with the sawdust, which, from its great power of absorption, will remove all the grease or oil, or so nearly so that but a light rubbing with waste is necessary to make the iron quite clean. This rule applies to the screwing and nutting of clips and bolts, or to other purposes where oil is used about iron. Oak or ash sawdust is the best. Pine sawdust has greater absorptive power, but leaves a resinous surface on the iron that is more destructive to the file than iron. My average weekly consumption for twenty-five files, using eight drills, is about three bushels per week."

© 1871 SCIENTIFIC AMERICAN, INC

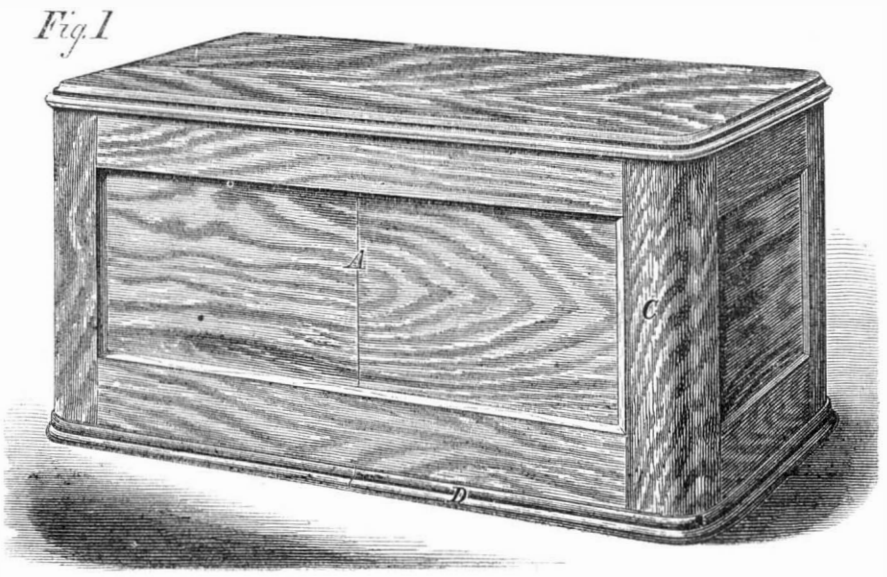
Improved Sewing Machine Cover.

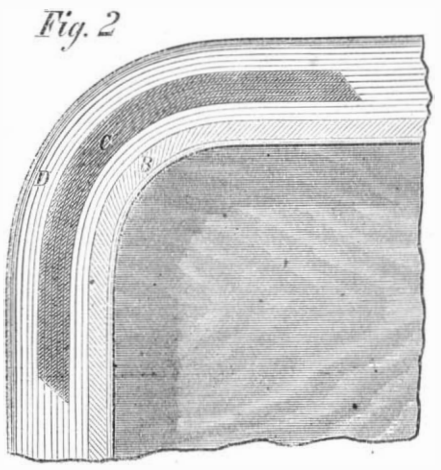
The sewing machine covers employed previous to the introduction of the improvement which forms the subject of the present article, and represented in the annexed engravings, have been liable to warp and crack, and from these causes have not proved as durable as desired. The improved cover shown in the engravings obviates this difficulty, and, as we are informed, it can be manufactured even more cheaply than the former inferior ones, it meets with great favor. A very large number, we are informed, are daily turned out from the factory of the proprietors.

A peculiar advantage besides those already enumerated, is that the materialof which the cover is made can be used without long preparatory seasoning. The reason will appear when we state that it is made wholly of veneers, cut thin and glued together in a press, which gives the proper form to the box.

The corners are rounded, as shown in perspective, Fig. 1, and the sides of the box are formed of one continuous hoop, joined at A. There are no joints at the corners, and no dovetailing is required.

Fig.2 is a full sized view of the lower edge of the box at one of the corners. B is a layer of white-wood veneers glued together, the grain of which is at right angles with the grain of the veneers which line it, as well as those which cover it on the outside. The grain of the latter runs longitudinally around the box,while the grain of the white-wood stratum is vertical.





FRENCH'S IMPROVED SEWING MACHINE COVER.

The grain of the vertical corner pieces, C, is also vertical. The grain of the horizontal pieces which, with the vertical corner pieces, C, inclose the panels, is longitudinal.

The top is made also of veneers glued together, as is also the bead or molding, D, which ornaments the bottom. The result of this construction is a box of elegant appearance, and of such resistant power to contraction and expansion from heat, that one shown us, and from which our engraving was made, said to have been baked in an oven at 212° Fah., presents the appearance shown in Fig. 1. It has not opened anywhere except in an almost imperceptible crack in the outside veneer of one of the panels, and only a very slight springing is perceptible in one of the lower edges.

This improvement was patented June 7, 1870, by Evelyn F. French, of whom information concerning the purchase of rights or orders for the article may be had, 340 Seventh avenue, New York city.

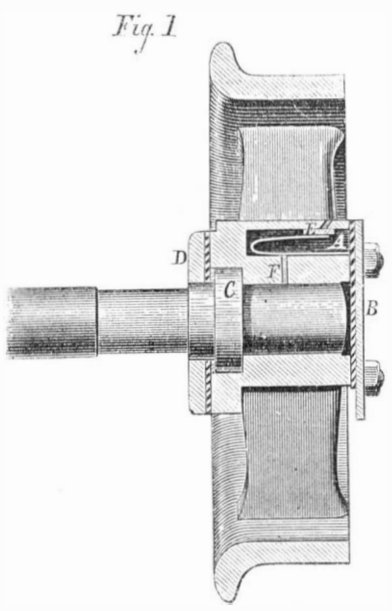
Improved Method of Attaching and Lubricating Car Wheels.

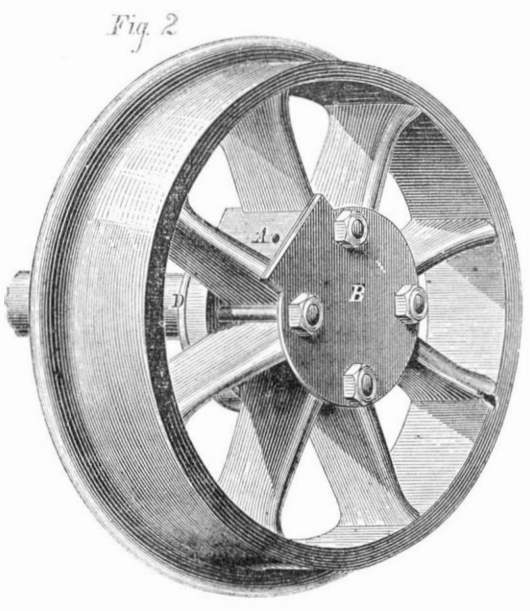
This invention is especially designed for coalcars in mines, the mode of lubricating the axles of such cars having been hitherto very imperfect, the oil having been allowed to escape from the axle, leaving it so dry as to greatly increase the friction, and to cause cutting of the metallic bearing surfaces unless frequently oiled, the waste of oil being great, and the work expended in propelling the cars being also notably increased.

If the oil be supposed to remain in the wheel until it has been run into the mine, where the wheel comes in contact with water, the water will get into the hub, and replace the oil, and cutting will soon commence, especially if the water be charged with sulphur or sulphureted hydrogen gas, as in this case mechanical attrition is aided by chemical action.

Also in the process of loading the cars the dirt or dust falls between the collar and the hub, intruding between the bearing surfaces and greatly increasing the mischief.

It is claimed that all these defects are overcome by the device illustrated in the accompanying engravings, in which Fig. 1 is a sectional view, the section being made through the center of the hub and oil chamber, and Fig. 2 a perspective view of the entire wheel and attachment.





REECE'S ATTACHMENT AND LUBRICATING DEVICE FOR CAR WHEELS.

Between two of the spokes of the wheel and adjoining the hub, there is formed a chamber, A, Fig. 2, in which the oil is placed. The chamber is open at one end, and is cast with the wheel. The open end of this chamber is closed with a plate, B, which is bolted firmly to the end of the oil chamber and hub as shown.

A recess in the hub receives the collar, C, of the axle; this collar and the inner plate, D, securing the wheel on the axle when the bolts are inserted as shown in Fig. 1.

Both the outer and inner plates are made tight with gum packing, and the external aperture for the admission of oil to the oil chamber is closed with a spring valve, E, except when in filling the latter is pressed down with a rod of wire. An opening, F, leading from the oil chamber to the inside of the hub supplies the bearing surfaces with oil.

It is claimed that this arrangement excludes water and dust, and that the chamber needs to have its supply renewed only at long intervals. The oil is not allowed to flow so copiously upon the axle as to pass out through the inner plate around the axle, but is supplied gradually as required.

Patented, through the Scientific American Patent Agency February 13, 1866, by William R. Reece, of Tremont, Pa., whom address for further information.

Damp Buildings.

Damp, when it enters a house, says Dr. F. R. Smith, comes in at the roof, at the doors and windows, through the walls, from the ground, or through leaking of pipes. The entrance of damp through the roof itself is fortunately so unpleasantly conspicuous, owing to its staining the ceilings, that it is not long in being found out, and before repairs more or less complete are made. But for this, roofs would be more commonly untrustworthy than they are, and injury to health and life would oftener occur through their failure. Many roofs are, however, so constructed that in times of great rain and of snow, an inundation is inevitable; and the situation of such houses as are near trees exposes them every autumn to the danger of overflows from gutters stopped up with dead leaves. Roofs, to remain dry, should be of sufficiently steep pitch for the nature of their covering; flat tiles requiring a steeper roof than "pan tiles," and these latter a steeper roof than slates. Whatever the covering the material should be good and well secured. Roofs should be so arranged as to dispense, as far as possible, with gutters and flats occurring in the middle of the building, but should, if practicable, throw off the whole of their water to the sides. The points where they join walls, parapets, and chimneys, are especially vulnerable, and should be especially protected, either by a lead "flashing" or by a cement fillet, with a small projection formed to overhang it in the brickwork. It is essential that tiles or slates should overlap one another sufficiently, and that if the covering be of metal (as lead, zinc, or copper), it should be so laid as to be free to expand or to contract with change of temperature; and in exposed situations it is essential for tiles, and desirable for slates, to be bedded in mortar. This, however, must be so done as not to prevent there being a clear drip from one tile or slate on to another; otherwise the mortar will become saturated, and will conduct the water to the inside of the roof.

Remedy for Rattling Window Sashes.

The sashes in very many costly and elegant dwellings are frequently so loose, from some cause, that when winds blow even gently they will rattle and bang from stop to stop, like the shrunken and decayed portions of some forsaken and dilapidated castle.

In some instances the sashes are fitted with too much play, both in the direction from one jamb-casing to the other, and also from the outer to the inner stops. Besides this, the shrinkage of the stiles of the sashes and the contraction of half-seasoned timber, of which the stops were made, have contributed to increase the defect alluded to, so that the annoying rattle and clatter during the night will frequently drive sleep from every eyelid. The unwelcome music of rattling windows will often arouse and electrify nervous and timorous persons quite as effectually as if a band of burglars were making an entrance into the dwelling.

The remedy is by no means difficult or expensive. Let the sashes be taken out of the window frame, and every part of the window examined. If the jamb-casings have been sprung, or are warped and twisted, the first step will be to remove the stops and straighten the face of the casings, which may be done most conveniently with a large rabbet-plane and a smoothing-plane. In case the sashes should be much too narrow for the frame, let one edge be dressed off true, and a thin strip fitted neatly, and glued and nailed to the edge of one stile. See that the outside edge of such stile is not tapering, even by the thickness of a heavy shaving. When the stiles are tapering only a trifle, the sashes cannot be moved up and down easily. Now put the upper sash in its place, and fasten the central stop with two or three long, slender wood screws, after which remove the outside stops and place them so closely to the stiles of the sash that the window will not rattle.

Then let the stops be secured on the inside so closely to the stiles of the sash that it will move up and down easily, without having so much play that the wind will rattle it. When the sashes have been fitted as directed, there will be no more need of "weather strips" of any kind to exclude dust and cold air, and the expense of refitting a window as directed will be much less than the cost of weather strips.—*Technologist.*

Plastered Walls and Ceilings.

Particular care should be used in selection as to the strength and length of the hair to be used in the plaster for ceilings, and also as to the substance of the laths, which should in all cases be double. The plaster should be laid on with the minimum of thickness, a point much neglected.

With regard to the quality of the sand, it cannot be too good. Sand is apt to make the plaster too "short," only when there has been too much employed, and that with weak chalk-lime. It is impossible that the admixture of loamy earth in any proportion can benefit any description of mortar or plaster, and therefore clean grit must be preferable to either pit or road sand, for loam in any shape is detrimental in proportion to its amount.

One word with regard to a possible substitute for hair, as hair is becoming every day more difficult to obtain. In the pulling down of portions of old work for the reparation of the Lollards' Tower at Lambeth lately, some plaster of remarkable hardness was found; it was far superior to any of the rest, and upon examination was discovered to have been mixed with chopped rye-straw (recognized by several of the heads which had been mixed up) instead of hair. This plaster was wonderfully sound and firm. Possibly other descriptions of straw might be found equally suitable for the purpose, and at any rate it would be quite worth making some experiments on this subject.

Having obtained a really good plaster to work with, it is much to be wished that it might be applied in a somewhat more solid and durable manner than is usual, and that instead of flimsy laths nailed under the joists or on each side of partitions to receive it, short pieces of wood were fixed in between the joists or quarters, and the plaster trowelled on from front and back, so as completely to envelope these pieces of wood. By this means the plastering on partitions and ceilings would not be merely suspended coats, but integral portions of the structure, which, when dry would become almost imperishable and incombustible. Thus, instead of being flimsy, ill-connected things, inviting fire to destroy them, and the means of conducting that destroying element to all the other portions of the building, they would be, as it were, thin vertical or horizontal shields to prevent fire from spreading and touching the timbers. The use of plaster is, to a certain extent, common in Europe, and well deserves the attention of architects

© 1871 SCIENTIFIC AMERICAN, INC

Scientific American,

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN. S. H. WALES. A. E. BEACH.

☞" The American News Co.," Agents, 121 Nassau street, New York.

☞" The New York News Co.," 8 Spruce street, New York.

☞Messrs. Sampson, Low, Son & Marston, Crown Building, 185 Fleet street, Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

☞A. Asher & Co., 20 Unter den Linden, Berlin, Prussia, are Agents for the German States.

VOL. XXIV., NO. 4 . . . [NEW SERIES.] *Twenty-sixth Year.*

NEW YORK, SATURDAY, JANUARY 21, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

*Watt and Phelps' Variable Cut-off..... 47
*French Ironing Table..... 47
Xylonite..... 48
The Triumphs of Surgery..... 48
The Defense of Paris—French and German Artillery..... 49
Applied Science Popularized..... 49
Another Motive Power..... 49
Geography of the Sea Bed..... 49
The United States Signal Service..... 49
*Improved Door Guard..... 50
Defects in Locomotive Boilers..... 50
Collodion Balloons..... 50
*Perpetual Motion..... 50
Wire Stretcher for Fence Building..... 51
*Intrenching Tool..... 51
*Post-hole Borer..... 51
Ten Thousand Mill Hands in Fall River..... 51
Antiquity of Pulpits..... 51
Liquorice..... 51
*Shoemaker's Tool..... 51
The Law Applicable to Rejected Cases..... 52
Inspection of Stokers..... 52
Why Mainsprings break..... 52
Solar Motive Force..... 52
Man not Made of Clay..... 52
A fine Testimonial..... 52
Men of Progress..... 52
Rain-water Cistern..... 52
Engineering in India..... 52
An Idle Day at Fall River, Mass..... 53
Sawdust in the Smith-shop..... 53
*Improved Sewing Machine Cover..... 54
*Improved Method of Attaching and Lubricating car wheels..... 54
Damp Buildings..... 54
A Remedy for Rattling Window Shades..... 54
Plastered Walls and Ceilings..... 54
Facts and Figures about the Mont Cenis Tunnel..... 55
What ought a Mechanic to know?.. 55
Railroad Monopolies..... 55
American Gas Wells..... 56
The U. S. Signal Service and Storm Signals..... 56
New Chemical Products..... 56
Vapor Lamps and Vapor Stoves..... 56
Personal Brevities..... 56
Danger from using old Petroleum Barrels..... 56
Progress of Foreign Invention..... 57
The Oxyhydrogen Gas Light in Buffalo..... 57
Dyeing Turkey Red..... 57
Ideas expressed in modified forms of Screws..... 57
Adulterated Sirup..... 57
Molding Figures in Paste, Wax, and Clay..... 58
The Wisdom of the Egyptians..... 58
Commerce of the World..... 58
The Stereoscope..... 58
Cartridge Making..... 58
Important Patent Decision..... 58
Business and Personal..... 58
Answers to Correspondents..... 59
Recent American and Foreign Patents..... 59
Applications for the Extension of Patents..... 59
New Books and Publications..... 60
List of Patents..... 60

FACTS AND FIGURES ABOUT THE MONT CENIS TUNNEL.

Late cable news contains the great fact at last, that, theoretically speaking, light has penetrated the Alps. The workmen on the Italian side have exchanged greeting with those on the French side, and nothing remains now to be done but the finishing of the "enlargements." This tunnel completes the continuous rail line of the same gage, from the English Channel to Brindisi, in the south of Italy, 1,890 miles in length, which latter point is even now the great Mediterranean port, for the departure and arrival of steamships for the East *via* Suez Canal.

Mont Cenis lies between "St. Jean de Maurienne," in Savoy, and "Susa," in Piedmont, consisting of a high table land 7,000 feet high, rising abruptly to a peak nearly 12,000 feet high. The first Napoleon built a road 18 feet wide over this mountain, costing 7,000,000 francs. Then followed the railroad with three rails in 1867, which has had fearful snows, and heavy gradients to contend with, and, being of narrow gage, has been only of temporary benefit.

The tunnel was commenced in 1857, and work has been unceasing day and night ever since. Its length is 7 miles, 1,020 yards. "Bardonneche" is the name of the Italian end, while the French terminus is called "Fourneaux." The Italian end is 4,380 feet above the level of the sea, the French end being elevated 3,946 feet. The tunnel grade line is 1 in 2,800, rising from the Italian end, to about the center, then falling 1 in 45 to the French end.

The rock passed through seems to have been schist, quartz, and limestone. Commencing at the French end, there was schist for about 2,400 yards; average progress, 4 feet per day; then 550 yards of quartz, average progress, 2 feet per day; then limestone for about 3,000 yards, average progress, 7 feet per day; the balance of the distance being principally schist, with an average progress of 5 feet per day.

The tunnel is 25 feet wide and 24 feet high, and during the prosecution of the work was divided by a temporary wooden flooring into two galleries—one above, the other below—bad air passing out of the former, and fresh being supplied by the latter. About 4½ miles was done from the Italian end, and the rest from the French. Four years after the boring was commenced, compressed air was first used for running drills on the Italian side. Immense "compressers" were necessary, which were worked by water-power, and the air compressed to one sixth, or a pressure of six atmospheres. Ten machine drills have been constantly at work at each end, but those on the French side did not begin until 1863. Powder and nitroglycerin were used, but we have no statistics as to their relative merits.

The "shifts" were 8 hours each, similar to those on the Hoosac tunnel, giving the men 16 hours rest alternately. The wages paid miners were about 5 francs per day, and "muckers" about three francs per day.

Many lives have necessarily been lost during this great work, but far less than one would suppose; probably from 600 to 800 in all, so far as we have heard from time to time.

We have not seen the whole cost of the work mentioned so far, but it cannot be much short of 160,000,000 francs, or $29,920,000.

WHAT OUGHT A MECHANIC TO KNOW?

We cannot answer this question for every special trade, but there are certain principles involved which apply to all conditions of labor, and these we can employ for the solution of the inquiry. There was a time when to labor with the hands was a disgrace, and from the number of poor doctors, briefless lawyers, and churchless divines there are to be met with even now-a-days, we wight infer that some people still had a lingering fear of soiling their fingers with undignified labor.

According to an old India legend, the priesthood came from the head, the soldier from the arms, and the mechanic from the feet, of the god Brahma. It was in the interest of the priesthood to keep out all knowledge, as their religion was founded on superstition, and would not bear the light of science. No doubt the mechanic of those days was expected to know very little, as very little was required of him, and civilization and the arts were made to suffer in consequence. Some important discoveries were made, notwithstanding the discouraging circumstances, but nobody knew how to use them. The Chinese invented gunpowder several thousand years ago, but did not know how to use it for any other purpose than for fire-works. Many chemical compounds were known to the Arabs, but they appear to have had no application for them. There was a want of knowledge on all sides—progress was necessarily slow.

We have attained great prosperity in our day, because our industry has been raised to the high condition of art. If we do not wish to retrograde, we must take care that our mechanics receive an education in many branches of knowledge, and we now propose to point out what some of the requirements are.

The mechanic must learn to know the forces of nature, in order to apply them to his wants. If he does not understand these forces he will be constantly exposed to errors and loss. Arkwright labored for years upon his loom, without being able to complete it, and it was not until his partner, Strutt, brought a knowledge of mechanics to bear, that the invention was perfected. Watt could never have constructed his steam engine if he had not previously learned from Dr Black the laws governing the expansion of vapors; and he had the good fortune to live in an age where there were enough people who understood the laws of physics to be able to appreciate and sustain his invention. The celebrated French Professor Papin was not so fortnnate. He attempted to construct a steamboat in 1690, and was so far successful as to propel it as far as the source of the Weser river. In order to descend this river with his boat it was necessary for him to obtain the consent of the king of Hanover. He accordingly wrote a letter to the great German philosopher, Leibnitz, accompanied by plans and specifications of his invention, and asking the powerful interposition of the philosopher, with the ministry, to obtain this permission. The original letter is preserved in the library at Hanover, and the petition of Leibnitz, also, sustaining with all the forethought of a great mind, the request of the French refugee; but the opposition of the boatmen and the ignorance of the ministry defeated the whole enterprise, and Papin was driven out of the country, and is supposed to have died in great poverty in England.

The laws of nature that the mechanic must understand are classed under the general name of physics; heat, light, electricity, and magnetism, are the distinguishing forces, and they ought to be well understood and studied by every artizan. According to the modern law of conservation the sum total of forces in the universe is the same now as at the creation, the only difference being that they have exchanged places. If we let a ball fall to the earth, the motion imparted by gravitation does not cease when the ball is stopped, but it is changed to a motion of the smaller particles, and this latter movement is what we term heat. The asserted base is, in fact, warmer than it was before. We can, by means of one force create another, or we can substitute one force for another. And in all this we must keep in view that it is work that we wish to accomplish. A machine that will accomplish no work is of no value in our day.

The mechanic ought also to study the elements that are subject to physical laws. This branch of knowledge is called chemistry. It involves the study of the properties and uses of all ponderable matter. What are called elementary substances constitute the stock-in-trade of all the arts and sciences, and it is as necessary for the mechanic to understand them as it is for the merchant to be familiar with the goods he sells.

The mechanic must study mathematics. This branch of knowledge is the language and the key to all other sciences, and it is indispensable to success everywhere.

A knowledge of political economy and of the laws of trade is also necessary. The mechanic ought to understand the relation of labor to capital and the laws of commerce. With a knowledge of these branches of science and a skill in the use of implements, the mechanic in our age is the lord of creation, and every rank and honor is open to him. He is everywhere welcomed, for his presence increases the wealth and power of the land.

It is the fashion at the present time to exalt labor, and yet it is not often that the so called man of education takes to a trade. The old prejudices against labor still obtain, and our young men rush into commerce, or what are called the learned professions. This is a great mistake, and can be in a measure remedied by giving to the mechanic a higher education. The noble institution of Mr. Peter Cooper will go far to meet the want in our city, and future generations will cherish the memory of its founder as one of the benefactors of his race.

In a play called "The Carpenter of Rouen," the dignity and importance of the mechanic is thus aptly illustrated:

"The mechanic is God's nobleman. What have mechanics not done? Have they not opened the secret chambers of the mighty deep and extracted its treasures, and made the raging billows their highway, on which they ride as on a tame steed? Are not the elements of fire and water chained to the crank, and, at the mechanic's bidding, compelled to turn it? Have not mechanics opened the bowels of the earth, and made the products contribute to their wants? The forked lightning is their plaything, and they ride triumphantly on the wings of the mighty winds. To the wise they are floodgates of knowledge, and kings and queens are decorated with their handy-works. He who made the Universe was a great mechanic."

RAILROAD MONOPOLIES.

We see in the future of this country no danger more threatening than the growth and existence of enormous monopolies, particularly railroad monopolies. The past has demonstrated that our system of government gives almost unlimited scope for the growth of these enormous fungi upon the body politic. Their roots have struck deep, and their crimes against public morals smell to heaven.

Entertaining these views we have perused with great interest an article in the *North American Review* for January, from the pen of Charles Francis Adams, Jr., entitled the *"Government and Railroad Corporations."*

It needed not the vigorous pen of Mr. Adams to arouse the thinking men of this country to the peril of permitting these greedy corporations to continue their operations unchecked. The great problem with such men has been to devise any check that could be hoped to prove efficient under our present system of government. The corruption which exists in our civil service, the ease with which legislative bodies are manipulated, the lack of fidelity in judicial administration, each of which evils are mainly attributable to the corrupt influence of these bloated corporations, render almost any scheme of railroad reform hopeless.

Lest we should be classed among those pessimists who believe the world is going to the bad altogether, and that nothing whatever can stop it, we hasten to say that we believe in the great law of compensations, in social as well as natural progress. We do not believe the evils complained of are to be perpetual, but we do believe that no harder problem has ever presented itself to American statesmen than this of railway reform.

Seventeen years ago (writes Mr. Adams), six roads divided the route between Albany and Buffalo, and in 1853 these were consolidated into one. Three years ago four roads connected New York with Chicago, and these four were then reduced to two. One year ago five roads divided among them the distance between the Atlantic and the Pacific; six months ago these five were practically reduced to three. How long will it be before these three are reduced to one? How long before consolidation, as yet confined to connecting, will extend to competing roads? It is perfectly useless to discuss the question whether this massing of wealth and of power is desirable or otherwise. It is sufficient to recognize the fact that it is inevitable—that it is a natural law of growth. Legislation could only wage a futile war against it: checked in one form, it would devise another; by indirections it would find directions out. It has been steadily going on from the beginning; it is now going on, and it is not likely to stop. No legislation can prevent it, even were such prevention desirable. Any attempt in this direction will but result in a recourse to subterfuge, and the practical reduction of law to a dead letter. You cannot prevent, but you may, by looking at facts as they are, not inefficiently regulate. How this can best be done is the problem.

Whether Mr. Adams means, in the last sentence of this extract, to intimate the mere possibility of regulating railroads, or to assert his opinion that a system of regulation can be practically applied at this juncture, is not altogether clear.

Speaking of the assumption of railroad jurisdiction by the national government, he says: "It is impossible, in view of past experience, not to entertain grave doubts as to the result of any experiment of this sort, made through the political machinery which exists in America." As a substitute for such an assumption of railroad jurisdiction by the general government—which, he predicts, must come sooner or later—and for State regulation or control, which last he regards as but "temporizing expedients," important simply as illustrating the practical value of certain theories, he makes the following suggestion:

A safer solution of the difficulty may not improbably yet be found in effective regulation, than in State ownership. This last looks to the destruction of the principle of private corporate life as the basis of the railroad system, and to the adoption of the whole of it into the body politic. Regulation, on the other hand, proposes to have the government, while preserving the separation between the body politic and all private industry, yet exercise an active control over its own creations. This is the tendency of legislation in many of the Western States, where the results of government meddling are still fresh in the popular memory. Foremost among these States is Illinois. In the remarkable constitution just adopted there the great principle is for the first time recognized that the railroad system is exceptional among all industrial pursuits, and must be recognized and dealt with as such. This in itself is an immense stride in advance. The one striking feature of the Illinois constitution is the strong resolve of its framers to do away with what are known in England as "private bills," and in this country as special legislation. A sound system of government should recognize individuals no more than the laws of nature recognize them. The law should apply to all, without discrimination for or against

This final result is not attained in the Illinois constitution; had it been, the value of that instrument would have been more than doubled. Indeed, the provision made in it brings the innovator just to the fatal point; as yet he has done nothing, but the next step involves everything. In spite of its constitution Illinois must now slip back in the deep mire of special railroad legislation, or it must go on and solve the problem. The case stands thus: the constitution implies the

© 1871 SCIENTIFIC AMERICAN, INC

passage of (1) laws prescribing reasonable rates of charges on the different railroads, and (2) laws to correct abuses and prevent unjust discrimination and extortion in the rates of freight and passenger tariffs.

Now it is easy to talk about abolishing the evil of special legislation, but *how* is the yet unanswered question. Does anybody believe that in the State of New York a body of men could be convened to amend the constitution who would not be, at least enough of them, directly or indirectly chosen by those corporations who are always on the lookout lest their power should be crippled? If we could be certain of representation by incorruptible men, if legislative enactments were no longer influenced by bribery, if rings, and lobbies, and factions, did not rule, and government was in truth as in name, vested in the hands of the people, there might be some hope of speedy cure for our disease, but when the whole body politic is impregnated with virus, and these unsightly and loathsome excrescences burden every part, and sap the vitals of our institutions, the advice of Mr. Adams is like telling us to put salt on the tails of the birds we would catch.

It is easier far to point out defects in our system than to prescribe remedies for them. Mr. Adams has in his article shown in a strong light many of these defects; we fear, however, that only one of those compensations by which "time makes all things even," in human affairs as well as in physical phenomena, will enable us to slough off these rotten monopolies.

AMERICAN GAS WELLS.

The discovery of petroleum, and still more, the series of remarkable discoveries relative to its complex composition, and the seemingly almost interminable series of products which may be derived from it, have produced an effect upon modern industry the magnitude of which is probably but dimly appreciated, even by those most familiar with the subject. The boring for petroleum has also resulted in the discovery of natural gas deposits of great magnitude, from which the flow seems unlimited, and which may possibly lead to results of nearly as great importance as those which have accrued from the discovery of petroleum.

At present no one can tell the number or the location of these gas deposits. Still more is it impossible to determine the nature of the mysterious process going on in nature's subterranean laboratory, by which these gases are generated. This much, however, seems probable, that the generation of the gases in question is continuous, rather than the result of some former chemical action, by which an accumulation has been stored up, and from which the supply is now obtained. This view is based on the fact that the flow seems increasing rather than diminishing in volume, even from wells that have been delivering gas for years.

The most important of these natural gas deposits yet discovered, seems to be at Erie, Pa., and the present article will be chiefly confined to a consideration of these, with a brief sketch of their development, and the industrial uses by which the gas has been found applicable, compiled from facts placed in our possession by correspondence, and articles which have appeared from time to time in the Erie newspapers.

The first well at Erie was discovered in 1859. In this year an adventurous oil-seeker commenced boring for oil at a point near what is now called Eighteenth street, and after boring to a depth of about two hundred feet, relinquished the undertaking, although there were strong indications of oil, and an abundant flow of gas. The drilling was performed by the old spring-pole method, and though one or two attempts were made by other parties to sink the well deeper by the same method, the work was so arduous that the well was finally abandoned in the fall of 1860.

During the summer and fall of the same year a second well was sunk not far from the first, and at a depth of twenty feet a large amount of gas commenced flowing. This gas burned with a brilliant flame, and deposited a whitish material resembling paraffine, or "a fatty substance not unlike, in color and consistency, a yellowish-white butter." This well was worked by hand for some time, and made very slow progress. The work was continued for about three years, when oil was struck, and the well being tubed and pumped, gave a yield of only about one barrel per day. Last summer the tubing was withdrawn, and some modifications made, which permitted the free escape of the gas, when the yield was increased to from three to four barrels of fine, heavy, lubricating oil per day.

In 1864 a well was sunk by the "Erie City Oil Company," to the depth of 780 feet. No oil was obtained, but a very large flow of gas has issued ever since from the boring. The well being abandoned by the company, an enterprising soap manufacturer caused it to be tubed, and has used the gas for five years as fuel and lighting material for his factory, and also now heats and lights his dwelling-house, near by, by the same gas. He boils six large kettles in his factory, besides lighting and warming it, and uses no other fuel whatever. The flow of gas from this well is stated to be on the increase. A considerable surplus over what is used for the above-mentioned purposes escapes.

In 1865 another well was sunk, which, at the depth of 640 feet, yielded a supply of gas sufficient to light a number of manufacturing establishments, and to generate steam at the "Erie City Iron Works."

There are now no less than eighteen completed gas wells, five in progress, and three shortly to be commenced.

Among these may be specially mentioned the "Water Works Well." Of this well the Erie *Daily Republican* says: "Its depth is 505 feet. For the first five weeks the gas was sufficient to make all the steam necessary in pumping 500,000 gallons of water per day (the amount then used in the city). At the present time the amount of water used is 1,000,000 gallons per day, and it is found necessary to use some coal. The present supply of gas is equal to from two and a half to three tuns of coal per day. The derrick and fixtures for a second well are now being put up, and it is proposed to go down at least one thousand feet or far enough to thoroughly test the question of both oil and gas."

A well near Tenth street for several months supplied sufficient gas to run a large distillery; but, becoming filled with water, it is at present idle.

One between Fifth and Sixth streets furnishes an equivalent of from two and one half to three tuns of coal daily to the "Canal Mills."

A well at the Fairmount Mills furnishes gas enough to light and warm the mill, with a large surplus, which is burned nightly in a mammoth street light just west of the mill.

The "Hopedale Flouring Mills" obtain enough gas from their well to drive a thirty-horse power engine, and to light and warm the mill. Of this well the paper above quoted remarks:

"It was first used about the 1st of October, and has not been relieved of any water since that time, and the flow has been very uniform. When the engineer first commenced, he marked the cock that supplies the boiler, so that he might determine the pressure. The result is, that there has not been the thirty-second part of an inch difference, one way or another. The furnace under the boiler is supplied entirely with gas, the mill warmed and lighted, Mr. Gingrich, the proprietor, warms and lights his house, his miller does the same, and a brewery is furnished with an amount sufficient to run one fire, several lights, and a ten-horse power engine. After supplying all these it is estimated that there still remains a surplus of from 35 to 40 per cent, which is allowed to escape. It is supposed that the well is about half full of water, and it is the intention to pump it out in a short time, to see what effect it may have upon the flow; but inasmuch as the supply greatly exceeds the demand, an increase is not a particular object at present. This may be set down as one of the best wells in the city. Seed-bag 210 feet from surface."

"A well located on Tenth street, in the yard of the Presque Isle Iron Works, has been used under the boiler and for lights and fuel, throughout these extensive works, since the last of August. The supply, although large, is hardly equal to the demand during the winter season, and another well is now being put down in the eastern part of the yard, which is now down seventy-five feet, and has an excellent show of gas, having struck a fine vein about twenty-five feet below the surface. The first well is 542 feet deep, and it is thought by the proprietors that the veins were partially filled up by allowing too much water and mud to accumulate. It is proposed, therefore, to work the new well as a dry hole."

The gas company put down a well last fall, which has been in use about six weeks. Its depth is 700 feet, and it is estimated to produce 1,000 cubic feet per day, which proves to be so profitable to the company that they have commenced a second well on Seventh street, east of the large gasometer.

It seems that this gas may be obtained anywhere in the vicinity of Erie, by boring for it, and if, as the prolonged tests already made indicate, the supply is a permanent one, it must add greatly to the resources (already large) of that city, as a manufacturing center.

THE U. S. SIGNAL SERVICE AND STORM SIGNALS.

Mr. A. Watson has addressed a circular letter to the members of the Congressional Committees on Agriculture, Commerce, and Military Affairs, setting forth that, mainly through his efforts during more than three years, a resolution was passed at the last session of Congress authorizing the Secretary of War to establish at military stations a system of storm warnings by means of telegraph and *signals* for the benefit of commerce. The letter further states that the chief signal officer who was charged with the execution of the law, at first agreed to test Mr. Watson's plan at forts and military stations, as was obviously intended; the resolution expressly mentioning *signals at military stations.* The circular further asserts that in place of establishing signals, as required by the resolution, the Chief Signal Officer has adopted the old system of weather reports published in the newspapers, entirely ignoring the law which calls for signals at military stations. This plan was tried for several years previous to the war by the Smithsonian Institution, and failed of any practical result. Under the Institution it was conducted without expense, but under the Chief Signal Officer it is very expensive. This system is too slow, is limited in its operation, is complicated, is neither applicable to commerce, agriculture, or floods, and, in Mr. Watson's opinion, will result in an expensive failure.

In order to induce the Secretary of War to test his plan—which we will explain further on—Mr. Watson has obtained and embodied in his circular requests from the mayors of nearly all the principal cities having forts or military stations and complete telegraph connections, and also requests of the governors of five States, with which requests he now appeals to Congress to pass a resolution ordering the Secretary of War to test his plan, for which he claims that an appropriation of only $1,000 is needed. The places at which he is anxious to have the system tested are Cincinnati, Ohio, Baltimore, Md., Washington, D. C., Boston, Mass., New York, Philadelphia, Troy, N. Y., Annapolis, Md., and Portland, Me., as requested by the mayors of the cities or the governors of the States in which these cities are located.

The success or failure of these experiments would determine whether the system of signals proposed by Mr. Watson could be profitably extended to embrace all the principal points in the United States.

This system is one substantially the same as one strongly recommended by us some time ago, consisting in a series of pre-arranged signals of discharges of heavy artillery which should announce to agricultural districts the approach of storm and the direction of its course, with the time that might reasonably be expected to elapse before its arrival.

We sincerely hope Mr. Watson may succeed in securing the action which he seeks of Congress upon this important matter. The trifling expense attending the experiments, and the benefits which would result from their success, certainly entitle their promoter to a candid hearing and generous treatment from the public for whose benefit his efforts are exerted.

NEW CHEMICAL PRODUCTS.

The hydrate of chloral, about which so much has been written during the past year, has now reached the stage of a quack medicine, and, in the hands of designing or ignorant people, is likely to occasion much mischief. It is sold in fluid form as an anodyne, mixed with gum or sugar water, glycerin, or some tincture, and as the strength of the preparation is not given and it is liable to undergo spontaneous decomposition, the patient can never tell how much of a dose he is taking. A bottle of chloral, put up in the usual style of a popular medicine, which was sent to us six months ago for examination, has entirely decomposed, and it would be dangerous to use it, as the nature of the products of decomposition are not well understood. We must utter a note of warning that it is never safe to take the hydrate of chloral uuless freshly prepared and upon prescription of a physician. It is a valuable hypnotic medicine, but is not to be trifled with.

NITRATE OF AMYL.—This ether has been known since 1844, but its use in medicine is of recent date. English physicians employ it largely as a remedy for asthma. For this purpose a few drops are poured upon a cloth and inhaled the same as ordinary ether. It is apt to produce violent headaches, and must be inhaled with caution.

PEPSIN.—This valuable preparation has grown into some disrepute in consequence of the spontaneous decomposition of its solutions. It has been made in a peculiar way by Dr. Liebreich, by which its keeping properties have been much improved. It is an agent that ought to be experimented upon in cases of diphtheria, diarrhea, purification of drinking water, indigestion, and dyspepsia.

VAPOR LAMPS AND VAPOR STOVES.

We constantly read of explosions and loss of life from the use of naphtha, benzine, and dangerous oils, in what are called vapor lamps and vapor stoves. These instruments of destruction are constructed with a reservoir placed above the stove, filled with the lightest and cheapest products from the distillation of petroleum. The highly combustible liquid is allowed to flow through a small orifice upon a hot plate, where it is ignited and burnt in a way to give out light or heat, according to circumstances. While it burns there is no danger of explosion, and if the apparatus were perfectly tight and there were no leakage, as soon as the stop cock was closed the fire would go out and no explosive gas would be produced; but here is the point of danger. A small leak or a little carelessness would easily fill the space with an explosive mixture of hydrocarbon gas with the atmosphere, and when an attempt is made to kindle the fire, the stove is worse than a powder magazine. It has been proposed to use gunpowder as a motive power, by allowing it to be fed through an hour-glass arrangement into a box where it could be exploded by electricity, but the difficulty of regulating the flow of the grains, and the uncertainty of the discharges, rendered the attempt to employ powder for machinery nugatory. These modern inventions for burning naphtha are very much on the same principle, and ought to be handled with extreme care. It is a question whether the fire commissioners ought not to prohibit their use altogether.

Personal Brevities.

The health of Sir R. Murchison is improving, and the case of Prof. B. Stewart, recently injured in a railroad accident, is progressing as satisfactorily as could be desired.

Mr. C. L. Bloxam, the author of several valuable text books, has been elected to succeed the late Professor W. A. Miller, as Professor of Chemistry, in King's College, London.

Dr. Debus has been appointed Examiner in Chemistry to the University of London, in the place of the late Dr. Matthiessen.

The lectures at some of the German universities are very thinly attended, as many of the students are in the army. At Marburg part of the courses is entirely suspended. At Göttingen only half the usual number of students are in attendance.

Professors Dumas and Deville are shut up in Paris; their families, however, are in Switzerland. Their scientific investigations are now chiefly confined to warlike and sanitary questions. Berthelot and Jarvin are also active in the same direction, but the two Becquerels have left Paris, much to the disgust of the Committee of Defense.

DANGER FROM USING OLD PETROLEUM BARRELS.—A case of poisoning has been reported in Germany from the drinking of cider that had been preserved in an old petroleum barrel, although the cask was thoroughly cleansed before using. After the funeral of the first victim the grave diggers returned to the house and partook of the same drink; one of them soon afterwards died, and the others had a narrow escape. It is well for the public to know that petroleum acts as a poison, the symptoms being dizziness and vomiting, and it is unsafe to use the old barrels for the storing of any articles of food or drink.

© 1871 SCIENTIFIC AMERICAN, INC

PROGRESS OF FOREIGN INVENTION.

PRESERVATION OF VEGETABLE LIQUIDS AND INFUSIONS.

A new English invention for the better preparing, clarifying, and preserving of vegetable juices and other liquids, such as lime and other fruit, juices, wines, malt liquors, cordials, and saccharine, or other vegetable or organic solutions, has just been announced. It consists in using for these purposes, singly or in combination with one another or with other substances, silica, hydrochloric acid, potassium, tannin, olein, essential or aromatic oils containing sulphur, glycerin, nitrides, hyponitrites, hyponitrates, and hyposulphites. Many of these substances have long been known and used for the purposes specified, and it is difficult to see how such a patent as this can be defended should it ever be contested.

PERFORATED GRATE BARS.

Another English invention is the making of grate bars perforated so as to permit the free passage of air through the bars, by which means they are constantly kept cooled, thereby preventing clinker or dross adhering to the bars, also preventing the burning, wear, and destruction of the bars through heat, and affording facility for the proper cleansing of the bars. Secondly, the perforations in the bars being in slanting and opposite directions to each other, the free passage of air through the bars to engines running short journeys is obtained without the engines being turned, and the bars are thus kept constantly cool in whichever direction the engine may be running.

MUSIC WRITING MACHINE.

An ingenious French invention is a machine for writing music. The inventor passes over a metal cylinder turning regularly by means of a clock movement and communicating with a battery, a band of paper impregnated with a solution that will decompose under the influence of an electric current, as in telegraphic apparatus according to Caselli's and other systems. The clock movement may be put in motion or stopped at will by an electric or mechanical stop or detent. The band of paper being placed on the cylinder, the inventor places above it a series of metal wires or plates isolated from each other in such a way that as they rest at one point on the paper in a parallel direction to the axis of the cylinder, they each communicate by means of a separate metallic wire with a contact apparatus placed under each of the keys of the keyboard of the instrument. These contact apparatuses are worked by the motion of the key, either by bringing together two wires or metallic plates, or by plunging one point in a jar of mercury communicating with the battery. The circuit is thus closed for each of the wires only when the key corresponding to it is lowered.

DRAWING FRAME FOR COTTON.

This is an English invention and consists in placing on an ordinary drawing frame, and at a convenient distance in front of the front drawing rollers, a series of short tubes, one for each sliver, in such a way that the tubes are capable of revolving whilst the slivers pass through the center, the tubes being caused to revolve rapidly by means of an endless strap or band passing round and driven by a pulley which receives its motion from the main driving shaft or any other convenient shaft of the frame.

CARTRIDGES.

An Austrian inventor makes cartridges with packing preferably of paper in the form of a small ring or disk of the size of the primer or cap-cavity; the ring or disk is placed either on the primer or in the cavity, and the primer or cap is then pressed down tightly on the same. Instead of paper the inventor may use other materials which are softer than the material from which are made the cartridges, primers, and primer cavities.

IMPROVEMENT IN PROJECTILES.

An English device consists in applying the projective force by means of an annular cartridge approximately to the center of gravity of a hollow cylindrical or tubular projectile, instead of, as is usual, at the base; a rotary motion being, if desired, imparted to the projectile by rifling it externally and internally. The projectile or shot is in the form of a hollow cylinder, thus destroying the vacuum in the rear of the shot, and is of the same internal diameter throughout its length and for part of its length, such part being the rear end of the shot, of the same thickness.

PRESERVING WOOD.

This invention is also English. The process is as follows: The inventor places the wood in a closed cylinder or other chamber of any construction or form, in which it is heated by the vapors of liquid hydrocarbon, such as creosote or dead oil, coal tar, wood tar, resins, and bituminous substances, or by the smoke of wood, peat, or any other matter containing vapors or oils that can be drawn off by heat. One of the ends of each separate piece of wood is made to communicate with the external air, or with condensing pipes or chambers converted with an air pump or other means of producing a vacuum, so as to aid the escape of the sap-moisture and air contained in the wood, which is driven through the pores (dilated by the action of the heat) by the pressure of the vapor in the cylinder or chamber.

The Oxyhydrogen Gas Light in Buffalo.

We are informed that the Board of Trade of the city of Buffalo have obtained a franchise and organized a company to be styled the Oxyhydrogen Gas Company, having for its object the introduction of the oxyhydrogen gas light into that city. A committee of investigation have visited the oxygen gas works in this city, and with the information thus obtained, we are informed that the work is to proceed at once. It seems, then, that Buffalo is to be the first city in America to adopt this splendid light. We shall watch the progress of this new enterprise with great interest.

Dyeing Turkey Red.

This is a tedious, long process, and only profitable when produced in large quantities. The most expensive works for this purpose are in Elberfeld, Prussia, and the following is one of the methods there in use:

FIRST OPERATION.—100 pounds of yarn are first boiled in a weak soda lye, and aftewards well rinsed in the river.

SECOND OPERATION.—Soak 25 pounds of sheep-dung for a few days in a solution of 10 pounds of soda; then add to it 6 pounds of olive oil; strain it through a sieve; then handle through this the yarn, skein after skein; wring each out loosely, and lay it on slats, but so that no large lumps accumulate, as it will heat and set it on fire; the yarn must be turned from time to time on the slats, to secure an even drying; then finish the drying in a moderately warm room of 148° Fahrenheit. After it is dry the same operation is gone through with as at first; and the yarn receives from two to four operations through the dung and oil, according to the darkness of the shade wanted; it must be dried each time.

THIRD OPERATION.—6 pounds of olive oil and 10 pounds of soda are mixed in about 6 pails of water; if the oil should not become mixed and some swim on the top, more soda is required. Handle the yarn, skein after skein, through this as before; wring out loosely, and hang it up again to dry; the drying ought to be very slow, so as to give the oil time to ferment in connection with the oxygen, as it is considered that the warm oil can penetrate the fiber better; this operation also is repeated two or three times every time it is dried.

FOURTH OPERATION.—To the old remaining oil-bath add a solution of 10 pounds of soda; take the yarn through again as before, and dry.

FIFTH OPERATION.—Now lay the yarn into a warm solution of 10 pounds of soda for 5 hours, to free it from the superfluous oil not absorbed by the fiber, then rinse it well in the river.

SIXTH OPERATION.—Take the yarn through a decoction of 20 pounds of ground nutgalls and 10 pounds of sumach, in sufficient water, skein after skein; wring it out, and dry in the open air; turn it often, so as to secure an even color.

SEVENTH OPERATION.—30 pounds of good alum, free from any iron, such as will not show a blue shade if a few drops of yellow prussiate of potash solution are added; otherwise it will not make a bright color. This alum is neutralized from its free sulphuric acid by a solution of 3 pounds of soda slowly added, so as not to boil it over by the too sudden escape of carbonic acid gas; pass the yarn through this yet warm solution of alum, wring it out, and dry as before, but not too hot, as the acid of the alum might injure the cotton or crystallize the alum.

EIGHTH OPERATION.—The yarn is now freed from the loosely superfluous alum adhering to the fiber by soaking it in warm water, and rinsing well in the river.

NINTH OPERATION.—Into a suitable warm bath stir 100 pounds of good madder; add 50 pounds of beef blood; stir it well and enter the yarn; handle quick at first, so as to get it even, and bring it to a boil during 1 hour; then sling the skeins together and drop them into the liquor, and let them boil for one hour. It will be surer even by coloring only 25 pounds of yarn at a time; then rinse it.

TENTH OPERATION.—The yarn is again taken through an oil bath with soda as before and dried; then boil it in a solution of 5 pounds of olive oil, 6 pounds of castile soap, and 5 pounds of soda, from which it will come out bright red; then rinse it.

ELEVENTH OPERATION.—To still more brighten the color, without drying, put the yarn into clean bags and boil it for 2 hours in a bath containing 15 pounds of good white soap, $1\frac{1}{2}$ pounds of tin crystals, and $\frac{1}{2}$ pound of nitric acid.

Then take it out, rinse while yet hot, when it will be at last done.

This is the only fast-red which is good for bleached goods; others are less durable.—*The Art of Dyeing, by Haserick.*

Ideas Expressed in Modified Forms of Screws.

Every modification of the screw propeller, from the form of a common right helicoid, or "true screw," except some merely fanciful or arbitrary ones, has been the result of a certain determining idea, suggested or confirmed by experiment or reflection.

The idea of axial expanding pitch.—In this case, it being known that a screw, beginning to work in smooth water, soon acts to move rearward a column of water, the idea is that, as the entering element of the blade moves the water as described, the next element should, so to speak, chase it up, so as to press upon the moving water as heavily and effectually as the first element. This second element would give an increment of velocity to the already moving water, and so the third element, by a continued expansion of the pitch, would move backward faster yet, so as to catch up with the water, just as men, to push a rail car with a uniform pressure as its speed increases, must walk faster and faster.

The idea of radially expanding pitch, and of all screws which, by having a curved generatrix, appear bent back, that is, from the vessel, in a side view of the latter, is, to counteract the centrifugal action of the water, and confine it to a cylindrical column, having the disk (end elevation) of the screw for its base.

Among the most curious screws of this kind is Holm's conchoidal screw, having a rapidly expanding axial pitch, so that at the trailing edge the blade is tangent to a plane containing the axis of the screw, and therefore has, at that point, an infinite pitch. Also, at the outer circumference the edge of the blade is bent over from the vessel into a narrow cylindrical flange, which finally is rounded into the trailing edge at the corner, by a spherical or spoon-shaped surface.

Finally, the opposite idea of bending the blades toward the vessel, and of mounting them on rings, so as to leave the central portion of the disk open, is, to favor the rush of water from all sides into the partial vacuum which tends to exist behind, or on the after side of the screw. In the Griffith screw, the blades are widest at about the middle of their length, are bent towards the vessel, and are fitted by cylindrical arms into similar sockets in a large spherical hub or "boss." Each can be turned on the axis of its cylindrical arm, and thus the pitch is variable.

While preparing these pages, I am informed by an engineering friend who has made the experiment, that if sawdust be poured upon a screw model, while the latter revolves rapidly in a lathe, it will rather be drawn towards the axis of the screw than dispersed by the centrifugal force, developed by the rotation.

The result just stated may be explained as follows: The rearward discharge, by the screw, of a cylinder of water creates a constant tendency to a vacuum at the position of the screw. This tendency, being constant, is as effectual as a sensible vacuum, in inducing a constant rush of water from all sides to the spot where the screw works. This centripetal rush of water is believed to prevail over its centrifugal tendency, so that some, instead of bending the blades aft, or from the vessel, to confine the water radially, and so prevent its lateral dispersion, and discharge it rearward in an undiminished cylinder, have bent them forward, as already explained, or towards the vessel, in order to favor the inward rush of surrounding water at the base of the water cylinder acted upon by the screw. The Griffith screw, as said before, is thus formed.—*Elements of Machine Construction and Drawing.*

Adulterated Sirup.

The following paragraph has been going the rounds of the papers:

"John H. Pope, druggist, of New Orleans, says that the substance known as 'sugar drips,' and retailed as 'golden sirup,' contains no sugar at all, but is produced by the destructive action of strong sulphuric acid (oil of vitriol) upon starch. To test the difference between this and cane sirip, dissolve a teaspoonful of the 'golden sirup' in a wineglass of rain water; then add a few grains of tannic acid, when it will turn black as ink if the article is spurious. If the acid be not convenient to procure, make a cup of strong tea (which contains tannin), and add a teaspoonful of the 'golden sirup,' and a fair quality of ink will appear."

Prof. C. F. Chandler, in the *American Chemist,* comments upon this paragraph as follows:

Genuine sugar-house sirup, "golden sirup," is the liquor drained from the crystallized sugar of the sugar house, after all the sugar that can be profitably extracted from raw sugar has been separated.

The impure, dark-colored, raw sugar of the plantation is dissolved in water, purified, filtered, and decolorized. It is then boiled down in the vacuum-pan till it begins to granulate, when it is run into molds to cool.

The loaves are drained, cleansed with a saturated solution of pure sugar in water, and sent to market as lump, crushed, powdered, and granulated, "A" sugar.

The sirup which drains out of the loaves, called "greens," is again purified, decolorized, and boiled down to crystallization. The crystals are separated in the centrifugal machine, and sold as a very light-colored coffee-sugar. The "greens" from this sugar yield, by purification, decolorization, and boiling, a light-yellow sugar. The last "greens," after three successive crystallizations of sugar, are purified and sold as "golden sirup." This sirup still contains a considerable quantity of crystallizable sugar, which cannot be profitably extracted, together with uncrystallizable sugar, coloring matter, and the substances which give to sirup its peculiar agreeable flavor, but whose exact nature is not known.

The adulteration complained of is the dilution of this pure sugar-house sirup with sirup made from starch, or the entire substitution of starch sirup for sugar-house sirup. We have no fault to find with this portion of the statement, but the test with tannic acid or strong tea is totally fallacious. It is simply a test for iron, which is much more likely to occur in genuine sugar-house sirup than in the starch sirup complained of. The raw sugar is manufactured in iron vessels; the tanks, pipes, coal filters, molds, and often the vacuum pans in the sugar-house are made of iron, and as the solutions take up small portions of this metal, the sirup often, though not always, contains iron. The refiner is careful to prevent, as far as possible, the introduction of iron into the sugars and sirup, not because it is in any way injurious, but simply because if it occurs in the sugar to any extent, it produces a dark color when used in tea, which consumers dislike. As sirup is not used in tea, there is no real objection to a small proportion of iron; in fact, as iron is a good tonic, its presence is perhaps desirable. The starch sugar which we have seen manufactured on a large scale in Europe, would not be as likely to contain iron. This test, therefore, is simply a test for iron, and not a test for adulterated sirup; in fact, guided by this false test, one would be likely to reject pure sugar-house sirup, and select the starch sirup instead.

OPEN an oyster, retain the liquor in the lower or deep shell, and, if viewed through a microscope, it will be found to contain multitudes of small oysters, covered with shells, and swimming nimbly about—one hundred and twenty of which extend but one inch. Besides these young oysters, the liquor contains a variety of animalculæ, and myriads of three distinct species of worms. Sometimes their light represents a bluish star about the center of the shell, which will be beautifully luminous in a dark room.—*Journal of Microscopy.*

© 1871 SCIENTIFIC AMERICAN, INC

Molding Figures in Paste, Wax, and Clay.

We clip the following from the *Coachmaker's International Journal*:

TO MOLD OFF FIGURES IN PASTE.—Take the crumbs of a new-drawn white loaf, mold it until it becomes as close as wax, and very pliable; then beat it and roll it with a rolling-pin, as fine and as far as it will go; then point it on molds, and, when it has taken the suitable figure you desire, dry it in a stove, and it will be very hard; and to preserve it from vermin, you may mix a little powder of aloes with it.

TO MOLD SMALL FIGURES OF JASPER COLOR.—Oil your molds with a fine pencil, and diversify them with such colors as you please with gum tragacanth; if they spread or run, put a little of the gall of an ox, for the thicker it is the harder it will be; then mold your paste of the color of jasper, or the like, put it in to fill the mold, tie it with a wire, bake it, or take it out, repair and varnish it, and set it by to harden.

OF MAKING FIGURES OF CLAY OR WAX.—There is no need of many tools in this sort of work; the clay is placed upon an easel or table, and you begin and finish the work with your hands. Those who are used to it never make use of anything but their fingers, except three or four pieces of wood, which are roundish at one end, at the other flat, with a sort of claws and teeth, called by the French, *ebauchoir*—that is, a sort of hatchet; they are about seven or eight inches in length; those with claws are to smooth the stuff; the others, which have teeth, to scratch it.

They are made of wax thus: Take a pound of wax, half a pound of ocher, some add turpentine, and melt it together with oil of olives; put more or less, according as you would have the matter harder or softer; a little vermilion also should be mixed with it to give it a softer color. When you have made the composition, the figure is worked up with the hand, and those *ebauchoirs* made use of in making up the earthen figures. Practice is the principal mistress in this sort of work, which, at first, is not so easy as that in clay.

TO MOLD OFF THE FACE OF A PERSON IN WAX.—Take a pound of new wax, a third of colophony, melt them at a slow fire, let them cool so long as that you may endure some of it on your hand without burning it; then having oiled the face with olive oil, cover the hair of the eye-lids and eye-brows with paste; then with a brush nimbly cover the face about the thickness of a quarter of a dollar, being careful not stop the nostrils, and that the person squeeze not his eyes together, because that will render the face deformed.

Thus, having the face of wax, take it off gently and strengthen it with clay on the back side, that it may not give way. After this manner you may cast all sorts of faces; laughing weeping, grimaces, or wry faces; also fruits or anything else, dividing the mold into two pieces with a warm knife; then fortify them with clay and join them together.

There is no way of casting neater than this with wax, and after a very little practice you can become very expert at the business.

The Wisdom of the Egyptians.

The moderns are accustomed to pooh-pooh a good deal at people so unfortunate as to live before this nineteenth century; but just think what some of these remote people and times did manage to find out and accomplish for themselves. There was Egypt—oldest and wisest of the nations—what a record for her is deciphered, in the last fifty years, of her past.

What did the old Egyptian know about the oldest of the arts, about farming? He knew how to manage his great river—the one source of moisture and fertility in that climate—so as to turn the desert beyond its banks into a garden, and make Egypt a storehouse and granary for the surrounding nations. He built reservoirs so huge as to retain sufficient water from the overflowing river to feed it when it subsided—a lake four hundred and fifty miles around and three hundred feet deep—and this fitted up with a skillful system of floodgates, dams, and locks. These were water works on a stupendous scale, truly.

As to what he knew about building, who has not heard of his pyramids, those vast masses, some of which were old in the time of Abraham, and yet built with such faithfulness and skill that the masonry is still perfect? He knew how to quarry and move huge blocks of stone, ninety feet in length, and then cover them with accurate and beautiful chiseling. The whole land was full of these wonderful statues, obelisks, tombs, and temples.

About manufacturing, he knew how to weave linen so fine that each separate thread was composed of three hundred and sixty-five small threads twisted together. He knew how to dye it in purple, and blue, and scarlet, and how to em broider it. He knew how to get iron and copper from mines at Sinai, and how to make useful tools of them when obtained.

But what did he know about science? He understood geometry well enough, at least, for land surveying. He understood the rotundity of the earth, the sun's central place in the solar system, the obliquity of the ecliptic. He could foretell eclipses, the position of the planets, the true length of the year. He had found out a method of notation—two of them, indeed, the decimal and the duodecimal. As for chemistry, its very name (from Chemi, which means Egypt), tells us where it was first studied. No wonder that the Egyptians got the reputation, among their more ignorant neigh bors, of being magicians. As for books, the old Egyptians made paper and wrote on it, and we have now papyrus rolls made in the time of the early Pharaohs; but he went on further to turn his buildings, his obelisks, even his coffins, into books, inscribing them with histories and biographies, by representing on them, through paintings and sculpture, all his occupations and beliefs, his hopes and fears.

One asks in wonder where he got all this knowledge. Ancient Greece went to him for it, just as the American goes to Germany. We can trace the germs, at least, of our science and art to nations removed from us by ages; but whom did the Egyptians learn from? Were these sons of Ham the first to develop to such a marvelous degree the arts of life? Did they find out by original observation what has been transmitted to us? And through what remote antiquity were they slowly accumulating the experience which qualified them to establish such stable institutions, such settled traditions, such attainments in science and art?

No one can tell. At a point beyond our furthest traditiosn her records show her to us rich, powerful, cultivated, skillful. Of the long ages before she was able to record her changes, time has long obliterated all traces. The world had long forgotten all about her, till the researches of the last half-century brought to light her long-buried life. Strange enough it is to be brought face to face with the monuments of a civilization compared to which all European history is but of yesterday—which was old in the days of Abraham—and to find there so much in common with our own.

Commerce of the World.

France exports wines, brandies, silks, fancy articles, furniture, jewelry. clocks, watches, paper, perfumery, and fancy goods generally.

Italy exports corn, oil, flax, wines, essences, dye stuffs, drugs, fine marble, soaps, paintings, engravings, mosaics, and salt.

Prussia exports linens, woolens, zinc, articles of iron, copper, and brass, indigo, wax, hams, musical instruments, tobacco, wine, and porcelain.

Germany exports wool, woolen goods, linens, rags, corn, timber, iron, lead, tin, flax, hemp, wine, wax, tallow, and cattle.

Austria exports minerals, raw and manufactured silk, thread, glass, wax, tar, nutgall, wine, honey, and mathematical instruments.

England exports cotton, woolens, glass, hardware, earthenware, cutlery, iron, steel, metallic wares, salt, coal, watches, tin, silks, and linens.

Russia exports tallow, flax, hemp, flour, iron, copper, linseed, lard, hides, wax, ducks, cordage, bristles, furs, potash, and tar.

Spain exports wine, brandy, oil, fresh and dried fruits, quicksilver, sulphur, corn, saffron, anchovies, silk, and woolens.

China exports tea, rhubarb, musk, ginger, borax, zinc, silks, cassia, filagree works, ivory ware, lackered ware, and morocco.

Hindostan exports gold and silver, cochineal, indigo, sarsaparilla, vanilla, jalap, fustic, campeachy wood, pimento, drugs, and dye stuffs.

Brazil exports coffee, indigo, sugar, rice, hides, dried meats, tallow, gold, diamonds and other precious stones, gums, mahogany, and india rubber.

West Indies export sugar, sugar molasses, rum, tobacco, cigars, mahogany, dye woods, coffee, pimento, fresh fruit, and preserves, wax, ginger, and other spices.

Switzerland exports cattle, cheese, butter, tallow, dried fruits, linen, silks, velvets, lace, jewelry, paper, and gunpowder.

East India exports cloves, nutmegs, mace, pepper, rice, indigo, gold dust, camphor, benzine, sulphur, ivory, rattans, sandal wood, zinc, and nuts.

United States export principally agricultural produce, cotton, tobacco, flour, provisions of all kinds, lumber, turpentine, wearing apparel.—*Iron Age.*

The Stereoscope.

A recent number of the *American Journal of Chemistry* contained the following story of the first introduction of the stereoscope to the *savans* of France. The Abbé Moigno took the instrument to Arago, and tried to interest him in it; but Arago unluckily had a defect of vision that made him see double, so that in looking into the stereoscope he saw only a medley of four pictures. The Abbé then went to Savart, but he was quite as incapable of appreciating the thing, for he had but one eye. Becquerel was next visited, but he was nearly blind, and consequently cared but little for the new optical toy. The Abbé, not discouraged, called next upon Pouillet, of the Conservatoire des Arts et Metiers. He was a good deal interested in the description of the apparatus, but unfortunately he squinted, and therefore could see nothing in it but a blurred mixture of images. Lastly Biot was tried, but Biot was an earnest advocate of the corpuscular theory of light, and until he could be assured that the new contrivance did not contradict that theory he would not see anything in it. Under the circumstances, the wonder is that the stereoscope ever got fairly into France.

CARTRIDGE MAKING.—The work of making cartridges in Newhallville, Conn., has assumed great proportions since the breaking out of the war. Mr. Sage, the proprietor, has orders for several millions from Europe, and employs 300 girls, forty of whom are colored.

IMPORTANT PATENT DECISION.

Seymour et al vs. *Osborne et al.*—Appeal from the Northern District Circuit Court of New York.—This was an action brought for an infringement of patent in reaping machines. The Court below dismissed the bill, holding that certain improvements, although new in application did not require invention. The Court takes an adverse view and reverses the decree, directing a new trial, Mr. Justice Clifford delivering the opinion of the Court.

This decision involved the validity of the Seymour and Morgan and Palmer and Williams harvester patents. The Court unanimously sustains the patents in every particular. The effect of the decision is to render tributary to these patents every reaping machine using an overhung reel, a quadrant-shaped platform, and a rake sweeping over this platform in a curved path, which practically includes most of the successful machines now in use.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Steel Castings, of the best quality, made from patterns, at Union Steel and Iron Works, Rhinebeck, N. Y.

Steam Vade Mecum.—A Compendium of Simple Rules and Formulæ, for the Solution of all Problems in the Practical Application of Steam. By Julien M. Deby, late Professor at the Ecole Centrale, Brussels. By mail, $1.00. Walter Macdonald, 29 Beekman st., New York city.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus Address Portable Bath Co., Sag Harbor, N. Y. (Send for Circular.)

Wanted.—A first-class Machinist, familiar with sewing-machine work, and capable of taking charge of a manufactory. Address, with references, etc., A. W. M., Jr., & Co., 29 Beekman st.

Address J. Dane, Jr., Newark, N. J., for best and cheapest Presses, Lathes, Jewelers' Machinery, Small Engines, etc. Machinery and models to order.

Wanted.—Good second-hand 2, 3, or 4 spindle Upright Drills. John Bachelder, Norwich, Conn.

English and American Cotton Machinery and Yarns, Beam Warps and Machine Tools. Thos. Pray, Jr., 57 Weybosset st., Providence, R.I.

For Sale.—The Patent for Clothes Dryer, illustrated in SCIENTIFIC AMERICAN, Sept. 24, 1870. A. H. Patch, Hamilton, Mass.

Imp'd presses and dies for tin work; special drilling machinery for hardware manufacturers. Ferracute Machine Works, Bridgeton, N. J.

Cure for Drunkenness, sent by mail post-paid on receipt of 50 cts. Address Chas. W. Hall, M.D., New York city.

Rolling Mills at Auction.—Would call attention to advertisement in another column of sale of Rolling Mills at Baltimore. Rare chance for capitalists.

Wanted to purchase, a patent or arrange for the manufacture upon royalty of good and saleable articles or machines. The parties have shop, machinery, and capital. Address F. C. Beach, Stratford, Conn.

Nail Makers' Bead Grindstones. J. E. Mitchell, Philadelphia.

File Grinders' Grindstones. J. E. Mitchell, Philadelphia.

"Edson's Recording Steam Gage and Alarm," 91 Liberty st., New York. Illustrated in SCIENTIFIC AMERICAN, January 14, 1871.

Crampton's Imperial Laundry Soap, washes in hard or salt water, removes paint, tar, and grease spots, and, containing a large percentage of vegetable oil, is as agreeable as Castile soap for washing hands. "Grocers keep it." Office 84 Front st., New York.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

For small, soft, Gray Iron Castings, Japanned, Tinned, or Bronzed, address Enterprise Manufacturing Company, Philadelphia.

Situation Wanted by a Practical Draftsman. Best references given. C. Collins, 33 Nassau st., Newark N. J.

Thomson Road Steamers save 50 per cent over horses D. D. Williamson, 32 Broadway, New York.

Improved Foot Lathes. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

E. Howard & Co., 15 Maiden Lane, New York, and 114 Tremont st., Boston, make the best Stem-winding Watch in the country. Ask for it at all the dealers.

The best place to get Working Models and parts is at T. B. Jeffery's, 160 South Water st., Chicago.

Scale.—Allen's Patent will remove scale from steam boilers, and not injure the iron. Send for Circulars. Josiah J. Allen, Philadelphia.

Building Felt (no tar) for inside and out. C. J. Fay, Camden, N.J.

Patent Elliptic-geared Punches and Shears.—The greatest economy of power, space, and labor. Can be seen in operation at our factory, in Trenton, N. J. Address American Saw Co., 1 Ferry st., New York.

Hand Screw Punches and Lever Punches. American Saw Co., New York.

Steel Stamp Alphabets, Figures, and Names. E. H. Payn, Burlington, Vt.

Self-testing Steam Gage—Will tell you if it is tampered with, or out of order. The only reliable gage. Send for circular. E. H. Ashcroft, Boston, Mass.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

The Merriman Bolt Cutter—the best made. Send for circulars. Brown and Barnes, Fair Haven, Conn.

Manufacturers and Patentees.—Agencies for the Pacific Coast wanted by Nathan Joseph & Co., 619 Washington st., San Francisco, who are already acting for several firms in the United States and Europe, to whom they can give references.

To Cure a Cough, Cold, or Sore Throat, use Brown's Bronchial Troches.

Machinery for two 500-tun propellers, 60-Horse Locomotive Boiler, nearly new, for sale by Wm. D. Andrews & Bro., 414 Water st., N. Y.

Keuffel & Esser 116 Fulton st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

Cold Rolled-Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

House Planning.—Geo. J. Colby, Waterbury, Vt., offers information of value to all in planning a House. Send him your address.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Bliss & Williams, successor to May & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N. Y. Send for catalogue.

The Best Hand Shears and Punches for metal work, as well as the latest improved lathes, and other machinists' tools, from entirely new patterns, are manufactured by L. W. Pond, Worcester, Mass. Office 98 Liberty st., New York.

To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year

© 1871 SCIENTIFIC AMERICAN, INC

Rewards.

We will give the following rewards for reports of the best results in work or earnings with a Wheeler & Wilson Sewing Machine: Best report for a series of years—Reward, A No. 1 Wheeler & Wilson Machine. Best report for a single year—Reward, A No. 2 Wheeler & Wilson Machine. The reports to be made to us before Feb. 1, 1871.

WHEELER & WILSON, Manufacturers,
No. 625 Broadway, New York.

Geo. P. Rowell & Co., Advertising Agents,
No. 40 Park Row, New York, receive advertisements for all American newspapers at publishers' prices.

Back Numbers, Volumes, and Entire Sets of the SCIENTIFIC AMERICAN are or sale at low prices, by Theo. Tusch, 37 Park Row, New York.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

All reference to back numbers must be by volume and page.

GALVANIZING GRAY IRON CASTINGS.—The following is a practicable way to "galvanize" (in other words to zinc) cast-iron articles, in answer to query No. 8, Jan. 1st: Cleanse the articles in an ordinary chafing mill, which consists of a barrel revolving on its axis; when the sand is all removed take them out and heat one by one, plunging while hot in a liquid composed as follows: 10 pounds of hydrochloric acid, sheet zinc, *q. s.* to make a saturated solution. In making this solution, when the evolution of gas has ceased, add muriate, or preferably sulphate of ammonia, 1 pound, and let it stand until dissolved. The castings should be so hot that when dipped into this solution, and instantly removed, they will immediately dry, leaving the surface crystallized like frost-work on a window pane. Next, plunge them while hot, but perfectly dry, into a bath of melted zinc, previously skimming the oxide on the surface away, and throwing thereon a small amount of powdered sal ammoniac. If the articles are very small, inclose them in a wrought-iron basket on a pole, and lower them into the metal. When this is done, shake off the superfluous metal, and cast them into a vessel of water to prevent them from adhering together when the zinc upon the surface solidifies.—I. T. P., of Ohio.

PERPETUAL MOTION SEEKERS.—We are in receipt of several letters from correspondents asking our opinion as to the practicability of their supposed self-moving devices. We pronounce them all failures, and take this summary way of disposing of their communications, as we cannot reply to each separately.

M. A. G., of Pa.—Kerosene lamp chimneys are often very imperfectly annealed. This is undoubtedly the cause of their unequal durability. Thin glass is not so liable to break from the effect of heat as thick glass, provided all other things are equal. The essential features of oil wells are the same as those of artesian wells sunk for water. The limits of penetration of the earth's crust are various, arising from the nature of materials, increasing weight of apparatus, etc. No exact depth can be stated as the extreme limit. Temperature has been found to increase regularly in penetrating the earth's crust. There are difficulties connected with measuring exactly the temperatures at the bottoms of such borings, the chief of which is the presence of water.

J. T., of Mass.—The effective surface of a surface condenser is that with which the steam comes in contact. The heating surface of flues and tubes is on that side with which the fire comes in contact. The reason for this is that the colder side of a plate of heated metal will conduct heat faster than the hotter side, which approximates more nearly to the temperature of the body from which the heat is derived, and, consequently, whether the hotter body be inside or outside the tubes or flues, the side remote from it will be capable of transmitting all the heat that can pass through the side directly exposed to heat.

D. J. B., of Texas.—To post yourself in the theory of locomotive engineering, get "Bourne's Works on the Steam Engine," published by D. Appleton & Co., New York, and "Auchincloss on Link and Valve Motions," published by D. Van Nostrand, also of New York.

M. M.—The effect of high pressure steam pipes on wood is discussed at length in Vol. XXI. of the SCIENTIFIC AMERICAN, page 145 and onward, in the course of which discussion you will find instances recorded of wood taking fire in contact with such pipes.

W. E. A., of Mich.—Oyster shells have been used to remove the incrustation from boilers in the same way as they remove the incrustation from teakettles when boiled in them. They will not, however, always succeed. It will do no harm to try them.

N. H. W.—No society, so far as we know, has ever offered a reward for the discovery of perpetual motion. No truly scientific person can be found who believes in this chimera.

F. X. M., of Fla.—We have no information upon the breeding of opossums. It is a subject that we have yet to investigate.

V. C., of N. Y.—We gave on page 400, last volume, all the information in our possession concerning the Heliade.

J. D. B., of Pa.—Your query was published in No. 2, current volume.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

STEAM GENERATING AND DISTILLING APPARATUS.—An error occurred in our announcement of this invention in our column of Recent American and Foreign Patents, in our issue of January 10, 1870. It should have read as follows:

Morris Wood, Chilicothe, Ill.—This invention relates to a new and useful improvement in an apparatus for generating steam for cooking food or other purposes, where steam at low pressure only is required, and also for distilling purposes.

FIRE ESCAPE.—E. J. Hudson, Golconda, Ill.—The object of this invention is to provide for the public an improved instrument for reaching the upper rooms of buildings on fire. To this end the invention consists in the employment of a device commonly known as a "lazy tongs" for elevating grappling hooks, ladders, etc., to the windows of the room to be entered, and in the employment, in connection therewith, of novel and effective appliances for guiding and controlling the lazy tongs, for enabling the workmen to use the device on uneven ground, and for steadying and supporting the apparatus when in use and transporting it from place to place.

SULKY CULTIVATOR.—H. P. Jordan, Victoria, Texas.—This invention has for its object to furnish an improved sulky cultivator which shall be simple in construction, easily operated, and effective in operation, giving the operator full control over the forward or inner plows, enabling crooked rows to be conveniently cultivated, and grass and weeds to be cut up close to the plants, or even between the hills of the row being cultivated.

PISTON.—A. H. Smith, M.D., New York city.—This invention has for its object to improve the construction of pistons in such a way that the packing can be tightened and loosened, as may be desired, without removing it from the barrel or cylinder or disturbing its connections, and which shall, at the same time, be simple in construction, effective in operation, and easily operated.

ANIMAL POWER.—O. M. Brock, Monroeton, Penn. This invention has for its object to furnish an improved power designed to be operated by a dog sheep, or other small animal, for operating a churn or driving other machinery, and which shall, at the same time, be simple in construction and convenient in use, being easily adjusted according to the weight of the animal that is to operate it.

CLARINET.—Anton Fritsche, New York city.—This invention has for its object to improve the arrangement of keys, levers, and the working mechanism on clarinets, so that the same may be played with less difficulty than the instruments now in use under the same name. The difficulties to be chiefly overcome consist in such a position of the keys on the old instruments that the fingers must at times be rocked on the instrument in order to change from one key to another, which is a very tiresome movement; also in such an arrangement of keys that certain trills or rapid changes must be produced by the little finger, which is easily tired; also in the insufficient arrangement of holes, whereby certain sounds cannot be produced with clearness and precision.

DRAWER.—R. J. Roberts, New York city.—This invention has for its object to improve the construction of drawers used in stores, warehouses, etc., so that the same may serve to display the goods of which they are the receptacles.

SPRING BOTTOM FOR WAGON BODIES.—Ephraim D. Cramer, Hackettstown N. J.—This invention relates to a new and useful improvement in wagon bodies, and consists in making a spring of the bottom of the body and attaching the seat thereto, or supporting the seat thereon, thus obviating the necessity for any other spring for rendering the seat elastic.

STOVE PIPE SHELF.—Samuel J. Anderson, Cazenovia, N. Y.—This invention has for its object to furnish a simple and convenient adjustable stove pipe shelf, and which shall be so constructed as to adapt it to various sized stove pipes.

BEDS, CUSHIONS, AND OTHER UPHOLSTERING.—Horace H. Barnes, Hoosick Falls, N. Y.—This invention has for its object to improve the construction of beds, mattresses, cushions, chair seats, car seats, and other upholstering, so as to ventilate the said articles allowing the air to pass through them freely.

GRAVEL AND SAND HEATER.—P. Le Goullon, Pittsburgh, Pa.—This invention has for its object to furnish an improved heater for heating gravel, sand, and similar substances, which shall be simple in construction, easily operated, and effective in operation, heating the material quickly and uniformly, and with a comparatively small amount of fuel.

MACHINE FOR PULPING WOOD, ETC.—George Sinclair, Edinburgh, Scotland.—This invention consists in constructing and arranging a boiler or vessel of a strong, close form, which can be heated only by the direct action, or radiation of the heat, from the flame and heated gaseous products of combustion from ordinary forms of fuel and furnaces, through the outer shell or case of the boiler.

VALVE GEAR.—William R. Reece, Tremont, Pa.—This invention has for its object to so construct the mechanism for operating a slide valve that the valve will be slowly closed, quickly opened, and allowed to remain stationary a short time, when closed, to fully utilize the force of the expanding steam.

PICTURE NAILS.—T. C. Richards, New York city.—This invention has for its object to improve the construction of porcelain-headed nails or spikes, such as are used for hanging pictures, mirrors, looping curtains, etc., so that the nails may be driven into the wall with the porcelain heads attached to them, instead of having the said porcelain heads detachable, in the manner heretofore practiced.

CAR COUPLING.—George H. Weeks, Allegan, Mich.—This invention has for its object to furnish a simple, strong, durable, and effective car coupling, which shall be so constructed as to couple the cars automatically, as they are run together, and which may be easily and conveniently uncoupled.

PROPELLER.—Edgar Eltinge and John C. Brodhead, Kingston, N. Y.—This invention has for its object to furnish an improved device for the propulsion of vessels, which shall be so constructed as to utilize a larger percentage of the power applied for the propulsion of the vessel than is possible with the paddle wheels and screws, as heretofore constructed and operated, and which shall at the same time be simple in construction.

STEAM GENERATOR.—Mirabeau N. Lynn, New Albany, Ind.—This invention relates to improvements in the construction of sectional vertical boilers of tubes, and consists in a square, circular, or other formed shell of tubes placed side by side, and connected at the ends to short large tubes, to form a figure corresponding in form to the cross section of the boiler to be made. part of the said tubes forming the shell being provided at the inside with circulating tubes connected to them at both ends, and projecting into the space above the fire, and the large transverse tubes at the ends being connected at the outside with return tubes for the promotion of the circulation by allowing the water to return to the bottom of the tubes forming the case; and the case being covered by a coil of feed-water and exhaust pipes, which protects it, and takes up and utilizes the heat given off by the shell.

HAMES.—Hugh B. Grumbling, Grant, Pa.—This invention relates to a new device for locking the lower ends of hames together, and to the collar, and also to a novel adjustable drafthook attachment for the same.

COTTON-SEED PLANTER AND GUANO DISTRICUTOR.—William W. Croom, Montgomery, Ala.—This invention has for its object to furnish an improved machine for planting cotton seed and distributing guano, either or both and which shall be simple in construction, and effective and reliable in operation.

WASHING MACHINE.—A. Z. Young, Liberty, Miss.—This invention relates to improvements in washing machines, and it consists in a vertically working dasher at one end of a rectangular case, and a horizontally reciprocating dasher at the bottom, arranged in connection with a vibrating frame mounted horizontally on the case, so that the dashers will be worked against the clothes alternately, in a way to shift or turn them while beating them, in an efficient manner.

DENTAL LATHE.—Elias C. Rishel, White Haven, Pa.—This invention relates to improvements in dental lathes, and consists in an arrangement of the mandrel and the bearings therefor, to admit of readily removing the mandrel from the supports, as is often required for shifting or changing the wheels on the mandrel.

STOVE POLISH.—R. E. Cherrington, So. Boston, Mass.—This improved compound for stove blacking consists of glycerin and plumbago mixed to form a suitable paste for the purpose.

HAY PRESS.—F. F. Hamilton, Green Bay, Wis.—This invention relates to improvements in hay presses, and consists in an arrangement with the follower, of cords, guide rollers, and a winding drum for actuating it, by winding the cords on the drum, the said cords acting directly on the follower. It also consists in a combination with the case, the follower, and the operating cords, of a crane for raising the followers.

LIFTING JACK.—Orrin A. Anthony, Mayfield, N. Y.—This invention relates to improvements in portable apparatus for lifting and moving stones and other heavy bodies, and consists in a standard provided with a foot stand, a notched plate or other suitable device at the top for the reception of the upper end of a brace or shore to support it in a leaning position, on which post a notched lifting bar provided with hitching tackle is arranged, to be raised, held, or lowered, by a lifting pawl or clevis attached to the end of a working lever, and a holding pawl or clevis attached to the post.

MILL BUSH.—Hamlin F. Frisbie, Danville, Ill.—This invention relates to improvements in the bushes used in mill stones for supporting and lubricating the spindles, and consists in an arrangement, between the chambers for the bearings, of air ventilating passages for cooling the bearings and the spindles, also an arrangement of oil chambers in the bearings for containing oil and feeders therefor, and a mode of adjusting the bearings by wedges worked from below by screws with studs for turning them, accessible while the mill is running.

APPLICATIONS FOR EXTENSION OF PATENTS.

MACHINERY FOR CLEANING AND SEPARATING COTTON, WOOL, FUR, AND OTHER FIBROUS MATERIALS.—Isaac Hayden, Lawrence, Mass., has petitioned for an extension of the above patent. Day of hearing, March 1, 1871.

WATER WHEELS.—Samuel Reynolds, Ellisburg, N. Y., has petitioned for an extension of the above patent. Day of hearing, March 8, 1871.

HARVESTING MACHINE.—George Esterly, Whitewater, Wis., has petitioned for the extension of the above patent. Day of hearing, March 8, 1871.

HARVESTER.—E. D. Buckman, Philadelphia, Pa., and Samuel A. Sisson Queensbury, Vt., executors of S. S. Allen, deceased, have petitioned for the extension of the above patent. Day of hearing, March 22, 1871.

HARROWS.—Sidney S. Hogle, Berea, Ohio, has petitioned for an extension o the above patent. Day of hearing, March 1, 1871.

STEAM BRAKES FOR RAILROAD CARS.—Theophilus E. Sickles, Omaha, Nebraska, has petitioned for an extension of the above patent. Day of hearin March 8, 1871.

New Patent Law of 1870.

INSTRUCTIONS

HOW TO OBTAIN

LETTERS-PATENT

FOR

NEW INVENTIONS.

Information about Caveats, Extensions, Interferences, Designs, Trade-Marks, and Foreign Patents.

FOR Twenty-five years, MUNN & Co. have occupied the leading position of **Solicitors of American and European Patents.** During this long experience they have examined not less than *Fifty Thousand Inventions*, and have prosecuted upwards of THIRTY THOUSAND APPLICATIONS FOR PATENTS. In addition to this they have made, at the Patent Office, *Twenty-Five Thousand* Special Examinations into the novelty of various Inventions.

The important advantage of Munn & Co.'s American and European Patent Agency is that the practice has been tenfold greater than that of any other agency in existence, with the additional advantages of having the aid of the highest professional skill in every department and a Branch Office at Washington, that watches and supervises cases when necessary, as they pass through official Examination.

MUNN & CO.,

Ask Special Attention to their System of doing Business.

Consultation and Opinions Free.

Inventors who desire to consult with MUNN & Co. are invited to call at their office 37 PARK ROW, or to send a sketch and description of the invention, which will be examined and an opinion given or sent by mail without charge.

A SPECIAL EXAMINATION

is made into the novelty of an invention by personal examination at the Patent Office of all patented inventions bearing on the particular class. This search is made by examiners of long experience, for which a fee of $5 is charged. A report is given in writing.

To avoid all possible misapprehension, MUNN & Co. advise generally, that inventors send models. But the Commissioner may at his discretion dispense with a model—this can be arranged beforehand.

MUNN & Co. take special care in preparation of drawings and specifications.

If a case should for any cause be rejected it is investigated immediately, and the rejection if an improper one set aside.

NO EXTRA CHARGE

is made to clients for this extra service. MUNN & Co. have skillful experts in attendance to supervise cases and to press them forward when necessary.

REJECTED CASES.

MUNN & Co. give very special attention to the examination and prosecution of rejected cases filed by inventors and other attorneys. In such cases a fee of $5 is required for special examination and report; and in case of probable success by further prosecution and the papers are found tolerably well prepared, MUNN & Co. will take up the case and endeavor to get it through for a reasonable fee to be agreed upon in advance of prosecution.

CAVEATS

Are desirable if an inventor is not fully prepared to apply for a Patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Caveat papers should be carefully prepared.

The Government fee on filing a Caveat is $10, and MUNN & Co.'s charge for preparing the necessary papers is usually from $10 to $12.

REISSUES.

A patent when discovered to be defective may be reissued by the surrender of the original patent, and the filing of amended papers. This proceeding should be taken with great care.

DESIGNS, TRADE-MARKS, & COMPOSITIONS

Can be patented for a term of years, also new medicines or medical compounds, and useful mixtures of all kinds.

When the invention consists of a medicine or compound, or a new article of manufacture, or a new composition, samples of the article must be furnished, neatly put up. There should also be forwarded a full statement of its ingredients, proportions, mode of preparation, uses, and merits.

CANADIANS and all other foreigners can now obtain patents upon the same terms as citizens.

EUROPEAN PATENTS.

MUNN & Co. have solicited a larger number of European Patents than any other agency. They have agents located at London, Paris, Brussels, Berlin, and other chief cities. A pamphlet containing a synopsis of the Foreign Patent Laws sent free.

MUNN & Co. could refer, if necessary, to thousands of patentees who have had the benefit of their advice and assistance, to many of the principal business men in this and other cities, and to members of Congress and prominent citizens throughout the country.

All communications are treated as confidential.

Address

MUNN & CO.,

No. 37 Park Row,

NEW YORK.

© 1871 SCIENTIFIC AMERICAN, INC

NEW BOOKS AND PUBLICATIONS.

ELEMENTS OF CONSTRUCTION AND DRAWING, OR MACHINE DRAWING. With some Elements of Descriptive and Rational Cinematics. A Text-book for Schools of Civil and Mechanical Engineering, and for the Use of Mechanical Establishments, Artisans, and Inventors. Containing the Principles of Gearing, Screw Propellers, Valve-motions, and Governors; and many Standard and Novel Examples, mostly from American Practice. By Edward Warren, C.E., Professor in the Rensselaer Polytechnic Institute, and author of a series of works on Descriptive Geometry and Stereotomy. New York: John Wiley & Son, No. 15 Astor Place.

This is an excellent work by a well-known and justly esteemed author. It is rather too technical in its method for the majority of mechanical readers, but is admirably adapted to use as a text-book in a thorough course of engineering study. The plates are bound in a volume by themselves, a plan to be commended; the old method of folded plates, interspersed through the text or placed at the end of the work, being very inconvenient.

ON THE USES OF WINES IN HEALTH AND DISEASE. By Francis E. Anstie, M.D., F.R.C.P., Editor of the London *Practitioner*, assisted by the Editorial Staff. New York: J. S. Redfield, Publisher, No. 140 Fulton street.

NATURAL HISTORY. By Adrian J. Ebell, Ph.B., M.D. Part I. A Text-book extending to a History of Classes among Animals. Price, Fifty cents. Ebell & Co., Publishers of School and Popular Works, Room No. 18, Cooper Union Building, New York.

THE SECRETS OF THE ART OF DYEING WOOL, COTTON, AND LINEN. Including Bleaching and Coloring Wool and Cotton Hosiery, and Random Yarns. A Treatise based on Economy and Practice. By E. C. Haserick. Cambridge: Welch, Bigelow & Co., Printers to the University. Dr. J. B. Thompson, No. 45 Broadway, New York city, is the Agent for New York, Pennsylvania, Connecticut, Rhode Island, and New Jersey; and Charles C. Badlam, No. 23 Kilby street, Boston, is Agent for Massachusetts, Maine, New Hampshire, Vermont, the Western and Southern States, and Canada.

The above work is sold by subscription, and information will be given or subscriptions received by the agents named above. The work has been prepared by a practical dyer of thirty-six years' experience, whose communications have more than once enriched the correspondence columns of this journal. It is written in the plainest style, and its formulæ are expressed in the clearest language, so that there need be no mistake. Each recipe is accompanied with a sample of the color designed to be produced, on a specimen of yarn or cloth, handsomely mounted and numbered for reference. The work is one of the most important technical treatises ever issued in this country, and must meet with a large sale.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING JAN. 10, 1871.

Reported Officially for the Scientific American.

SCHEDULE OF PAT. NT FEES

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent, (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

For Copy of Claim of any Patent issued within 30 years $1
A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1
upward, but usually at the price above-named.
The full Specification of any patent issued since Nov. 20, 1866, *at which time the Patent Office commenced printing them* ..... $1·25
Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.
Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors. 37 Park Row, New York.

110,815.—GLASS LAMP.—John Adams, Birmingham, Pa.
110,816.—LAMP.—Albert Albertson, Jersey City, N. J. Antedated Dec. 30, 1870.
110,817.—STOVE-PIPE SHELF.—S. J. Anderson, Cazenovia, N.J.
110,818.—LIFTING JACK.—O. A. Anthony, Mayfield, N. Y.
110,819.—CASE FOR REED ORGANS.—C. E. Bacon, Buffalo, N. Y.
110,820.—BED, CUSHION, AND OTHER UPHOLSTERING.—H. H. Barnes, Hoosick Falls, N. Y.
110,821.—ADJUSTABLE DOOR FASTENER.—L. P. Barnes, Fitchburg, Mass.
110,822.—MACHINE FOR DRILLING SHUTTLES.—C. E. Billings, Hartford, Conn.
110,823.—ADJUSTABLE LOCK COUPLING FOR VEHICLES.—G. G. Burgess, Grafton, Ohio.
110,824.—COMPOUND FOR STOVE POLISH.—R. E. Cherrington, South Boston, Mass.
110,825.—WASHING MACHINE.—S. J. Clark, Richmond, Ind.
110,826.—INSULATED BOLT FOR RAILWAY RAILS.—J. W. Cochran, New York city.
110,827.—MARINERS' SOUND INDICATOR.—Jas. Cochrane, N.Y.
110,828.—RUBBER PAD FOR HORSE SHOES.—D. L. Corbin, Friendship, N. Y.
110,829.—SELF-ACTING SEWER-BASIN TRAP.—M. K. Couzens, Yonkers, N. Y.
110,830.—SPRING BOTTOM FOR WAGON BODIES.—E. D. Cramer, Hackettstown, N. J.
110,831.—WASHING MACHINE.—A. O. Crane, Boston, Mass.
110,832.—COTTON-SEED PLANTER AND GUANO DISTRIBUTOR. W. W. Croom, Montgomery, Ala.
110,833.—MANUFACTURE OF ARTICLES FROM PAPER PULP.—Francis Curtis (assignor to David Scrymgeour), Foxborough, Mass.
110,834.—FEED CUTTER.—William Dahlem, Madison, Ind.
110,835.—STEAM-ENGINE VALVE.—C. P. Deane, Springfield, Mass.
110,836.—CULTIVATOR.—W. A. Dryden (assignor to himself and J. M. Turnbull), Monmouth, Ill.
110,837.—CORN PLANTER.—Y. I. Edwards, Trenton, Tenn.
110,838.—VENTILATOR.—William Ennis, New York city.
110,839.—DRIVE SCREW.—D. F. Fetter, New York city.
110,840.—SHOE.—J. W. Fisher, Albany, N. Y.
110,841.—BINDING ATTACHMENT FOR HARVESTERS.—Abraham Freed and Jonathan Snook, La Porte, Ind. Antedated Jan. 7, 1871.
110,842.—CONNECTING ROD.—W. G. Freeman, Richmond, Va.
110,843.—MILL BUSH.—H. F. Frisbie, Danville, Ill.
110,844.—FIRE SCREEN AND STAND.—Hugo O. Fritsch, New York city.
110,845.—CLARIONET.—Anton Fritsche, New York city.
110,846.—LAMP BURNER.—Geo. P. Fuller, Humphrey, N. Y. Antedated December 30, 1870.
110,847.—HIDE-WORKING MACHINE.—M. B. Gould (assignor to himself and W. L. Shaw), Buffalo, N. Y. Antedated December 29, 1870.
110,848.—HAMES FASTENING.—Hugh B. Grumling, Grant, Pa. Antedated January 6, 1871.
110,849.—HAY PRESS.—Finlay F. Hamilton, Green Bay, Wis.
110,850.—STEAM PUMP.—Thomas Harrington, Pittsburgh, Pa.
110,851.—FIRE ESCAPE.—Edward J. Hudson, Golconda, Ill.
110,852.—ARTIFICIAL STONE FOR PAVEMENTS, WALKS, FLOORS, ETC.—Carleton B. Hutchins, Ann Arbor, Mich.
110,853.—SULKY CULTIVATOR.—Hugh P. Jordan, Victoria, Texas.
110,854.—BED BOTTOM.—William B. Judson (assignor to J. P. Nelson, Jr.), Poughkeepsie, N. Y.
110,855.—NEEDLE SETTER AND THREADER FOR SEWING MACHINES.—Jacob Karr, Washington, D. C.
110,856.—DEVICE FOR SECURING THE TINES OF HAY TEDDERS.—Delancy Kennedy, New York city.
110,857.—APPARATUS FOR GENERATING AND BURNING VAPOR FROM HYDROCARBONS.—Joshua Kidd, New York city.
110,858.—ROLLER SKATE.—Matthew H. Kimball (assignor to himself and James Garvey), San Francisco, Cal.
110,859.—ROOFING TILE PRESS.—John Koehler, Warren, Ohio.—Antedated December 1, 1870.
110,860.—PLOWSHARE.—John Lane (assignor to Hapgood & Co.), Chicago, Ill.
110,861.—GRAVEL AND SAND HEATER.—Philip Le Goullon, Pittsburgh, Pa.
110,862.—STEAM GENERATOR.—Mirabeau N. Lynn, New Albany, Ind.
110,863.—CARRIAGE-CURTAIN FASTENER.—Wm. H. Morse, West Newbury, Mass.
110,864.—HAND STAMP.—Marcus P. Norton (assignor to Helen M. Ingalls), Troy, N. Y.
110,865.—TRACTION ENGINE.—Treat T. Prosser (assignor to himself, Henry Waller, and W. S. Waller), Chicago, Ill.
110,866.—APPARATUS FOR SUPPLYING NAPHTHA TO VAPOR-BURNING STREET-LAMPS.—Frances M. Randall, Greenburg, N. Y.
110,867.—PICTURE NAIL.—Thomas C. Richards, New York city.
110,868.—LUBRICATOR.—Joseph Richter, Cincinnati, Ohio.
110,869.—DENTAL LATHE.—Elias C. Rishel, White Haven, Pa. Antedated December 31, 1870.
110,870.—DRAWER FOR STORES.—Robert Jordan Roberts, New York city.
110,871.—LATHE FOR TURNING WOOD.—Ira Rood, Elyria, Ohio.
110,872.—MAN-HOLE PLATE FOR STEAM BOILERS.—John D. Samson, Peoria, Ill.
110,873.—APPARATUS FOR BOILING AND TREATING PAPER STOCK.—George Sinclair, Leith, Scotland.
110,874.—PISTON.—Andrew H. Smith, New York city.
110,875.—CEREMONIAL BELL.—John W. Smith, Keokuk, Iowa.
110,876.—HORSE HAY RAKE.—Joshua C. Stoddard, Worcester, Mass.
110,877.—LIQUID METER.—William G. Stuart, Chicopee, Mass.
110,878.—METHOD OF COATING SAD IRONS, ETC.—William H. Towers, Boston, Mass.
110,879.—THIMBLE.—Edward B. Towle, Newburyport, Mass.
110,880.—CAR COUPLING.—George H. Weeks, Allegan, Mich.
110,881.—METALLIC CARTRIDGE.—Rollin White, Lowell, Mass.
110,882.—CURBING FOR EXCAVATIONS.—Henry Whitestone, Louisville, Ky.
110,883.—FASTENING FOR THE TIPS OF BILLIARD CUES.—Oliver C. Wilbur, Jr., Providence, R. I.
110,884.—BOILER FOR HEATING.—John G. Wilson, New York city.
110,885.—WASHING MACHINE.—Ananias Z. ng, Liberty, Miss.
110,886.—SNOW SHOVEL.—Albert Q. Adams, Wallingford, Vt.
110,887.—CHARGER FOR SHOT POUCHES.—Thomas W. Allen, Waterbury, Conn.
110,888.—FENCE.—Collester M. Ballard and Myron Morehouse, Johnsonburg, N. Y.
110,889.—HOT-AIR FURNACE.—William D. Bartlett, Amesbury, Mass.
110,890.—SPARK ARRESTER.—Darwin Beach, Oshkosh, Wis.
110,891.—EMBOSSING HAT LININGS.—Thomas W. Bracher, New York city.
110,892.—ANIMAL POWER APPARATUS.—Orville M. Brock (assignor to James H. Hawes and George Hawes), Monroeton, Pa.
110,893.—HAY TEDDER.—Alzirus Brown, Worcester, Mass.
110,894.—BEE HIVE.—Gustavus Adolphus Brown and Francis Adams McCallen, Russellville, Ky.
110,895.—FLUTING MACHINE.—Abner Burbank, Rochester, N. Y.
110,896.—GRAIN DRIER.—Lewis S. Chichester, Brooklyn, N. Y.
110,897.—CHURN.—Jacob Clark, Brush Valley, Pa.
110,898.—VENTILATOR OR BLOWER.—John F. Collins, New York city.
110,899.—FENCE.—Thomas C. Collins, Little Hockhocking, Ohio.
110,900.—PARLOR ORGAN.—James Cordley, Adrian, Mich.
110,901.—RAILWAY-CAR PLATFORM.—Rensselaer A. Cowell, Cleveland, Ohio,
110,902.—CHURN.—John Cram (assignor to himself and John S. Cram), Chicago, Ill.
110,903.—LATHE CHUCK.—Austin F. Cushman, Hartford, Conn.
110,904.—LOOM.—Hilas D. Davis, North Andover, Mass.
110,905.—VENTILATOR.—Edward Mortimer Deey, New York city.
110,906.—RAILROAD-CAR VENTILATOR.—John M. Dexter, Elmira, N. Y.
110,907.—APPARATUS FOR DYEING FABRICS.—Thomas Messenger Drown (assignor to W. A. Drown), Philadelphia, Pa.
110,908.—PROPELLER.—Edgar Eltinge and John C. Brodhead, Kingston, N. Y.
110,909.—BEE HIVE.—Thomas S. Engledow, Cedar Falls, Iowa.
110,910.—FENCE.—Admiral Faulkner, Mount Pleasant, Iowa.
110,911.—SHAFT TUG.—Kasson Frazer, Syracuse, N. Y.
110,912.—ROTARY ENGINE.—Samuel Gibson, Lancaster, assignor to himself and Alexander L. Hayes, Lancaster, and J. W. G. Wierman, York, Pa.
110,913.—SHUTTER FASTENER.—Ebenezer A. Goodes, Philadelphia, Pa.
110,914.—WRENCH.—John Goodin, Joliet, Ill.
110,915.—AIR ENGINE OR FAN BLOWER.—Gardner C. Hawkins, Boston, Mass.
110,916.—COFFEE ROASTER.—Louis Houcke, Springfield, Ohio.
110,917.—BROOM HOLDER.—Zadok Howe, Lowell, Mich.
110,918.—JOINT FOR FRAMES OF FOLDING UMBRELLAS.—Algernon S. Hubbell, Norwich, Conn.
110,919.—SAD IRON.—Hubert R. Ives, New Haven, Conn.
110,920.—AUGER HANDLE.—William A. Ives, New Haven, Conn.
110,921.—HAT.—Jeremiah Keith, Charlton, Mass.
110,922.—STREET LAMP.—John F. Kerns, Baltimore, Md.
110,923.—LOUNGE.—Oswald Kubitschky, Chicago, Ill.
110,924.—PLOW.—John M. Leonard, Marshall, Mich.
110,925.—BILLIARD TABLE.—William Lochhead, Brooklyn, N. Y.
110,926.—SLIDING STOP VALVE.—Henry G. Ludlow, 2d (assignor to Ludlow Valve Manufacturing Company), Troy, N. Y.
110,927.—GRINDING MILL.—Isaac Mayfield and William D. Mayfield, Mayfield, Ky.
110,928.—REGULATING THE DISCHARGE OF WATER FROM PUMPS.—John Mayher, East Hampton, Mass.
110,929.—ROTARY BLOWER.—Henry C. McIlwain and Alonzo Brumfiel, Connersville, Ind.
110,930.—VALVE FOR OIL PUMPS.—Henry Millingar, Pittsburgh, Pa. Antedated Dec. 30, 1870.
110,931.—CRADLE.—Albert H. Ordway, Haverhill, Mass.
110,932.—NECK YOKE OF HARNESS.—Albert Parliman, Palmyra, N. Y.
110,933.—STEAM VACUUM PUMP.—James H. Pattee and H. J. Graham, Monmouth, Ill.
110,934.—SPRING FOR WAGONS AND CARRIAGES.—Samuel J. Pearsall and Silas P. Briggs, Saratoga Springs, N. Y.
110,935.—VALVE GEAR.—Wm. R. Reece (assignor to himself and "The Iron Manufacturing and Coal Co."), Tremont, Pa.
110,936.—PUMP.—N. P. Sheldon, San Francisco, (assignor to himself and Wm. H. Hall, San José, Cal.
110,937.—BEEHIVE.—Luther S. Sisson, West Edmeston, N. Y.
110,938.—UNIVERSAL COG-WHEEL COUPLING.—Egbert Smith (assignor to himself and Martin Sherrick), Adams County, Ill.
110,939.—CURTAIN FIXTURE.—William H. Tambling, Eleroy, Ill.
110,940.—PIANO.—William F. Ulman, Boston, Mass.
110,941.—BOOK-CASE FOR SCHOOLS, ETC.—Peter T. Vannice, Kewanee, Ill.
110,942.—VESSEL FOR CARRYING LIQUID CARGOES.—Wm. G. Warden, Philadelphia, Pa.
110,943.—CUT-OFF FOR STEAM ENGINES.—William Watts and F. A. Phelps, Newark, N. J.
110,944.—MACHINE FOR BOARDING LEATHER.—Urban R. Williams and W. P. Martin, Salem, Mass.
110,945.—PRESSER AND STITCH DIVIDER FOR SEWING MACHINES.—Alfred S. Woodward, New York city.
110,946.—APPARATUS FOR PROCESSES FOR GENERATING AND BURNING VAPOR FUEL.—Alfred J. Works, New York city, and Henry A. Daniels, Washington, D. C., assignors to the United States Vapor-Fuel Co., New York city.
110,947.—PAPER-POLISHING MACHINE.—Abram Wright and George F. Wright (assignors to themselves and J. H. McNabb), Clinton, Mass.

REISSUES.

4,230.—DEVICE FOR BAKING BREAD.—Abram I. Quackenbush and Guilford Hawn, Fort Plain, N. Y.—Patent No. 99,109, dated January 25, 1870.
4,231.—CULTIVATOR.—Benjamin Tinkham, Cameron, assignor to Hapgood & Co., Chicago, Ill.—Patent No. 30,897, dated December 11, 1860.

DESIGNS.

4,563.—TYPE.—Andrew Gilbert, Boston, Mass.
4,564.—COAL HOD.—Christian Linder, Nauffen, Wurtemberg.
4,565.—SOLDIER'S MONUMENT.—Lewis A. Tifft, Springfield, Mass.
4,566.—COMBINED PENCIL AND RECEPTACLE.—Horace J. Wickham, Manchester, Conn., assignor to Joseph Reckendorfer, New York city.

TRADE-MARKS.

128.—PAINT.—Averill Chemical Paint Co., New York city and Cleveland, Ohio.
129.—LIQUID CHEMICAL PAINT.—Averill Chemical Paint Co., New York city and Cleveland, Ohio.
130.—CHEMICAL PAINT.—Averill Chemical Paint Co., New York city and Cleveland, Ohio.
131.—AGRICULTURAL FORKS.—Batcheller Manufacturing Co., New York city.
132.—CARPETS.—Lowell Manufacturing Co., Lowell, Mass.
133.—STEAM ENGINE.—Joel Sharp, Salem, Ohio.
134.—FRINGES, RIBBONS, AND TRIMMINGS OF SILK.—Silbermann, Heinemann & Co., New York city.

Advertisements.

The value of the SCIENTIFIC AMERICAN *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is orth $2.50 ver line to advertise in one of thirty thousand.*

RATES OF ADVERTISING.

Back Page - - - - 1·00 a line,
Inside Page - - - 75 cents a line,
for each insertion.

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

For Sale Cheap.

2 SECOND-HAND 50-HORSE ENGINES, in perfect order. For particulars address WM. WRIGHT & CO., Newburgh, N. Y.

FIRST PREMIUM awarded by Am. Inst., 1870. MICROSCOPES, MAGIC LANTERNS, } Illustrated price list and catalogues free to any address. T. H. McALLISTER, Optician, 49 Nassau st., N. Y.

THE PERFECT LUBRICATOR
A sure preventive of and cure for hot journals. Has ten times the lubricating quality of any oil. 4000° F., 50° below zero, acids or gases do not affect or change its wonderful, unique nature. Forms on bearing surfaces a glaze of unequaled smoothness, which economizes power 20 per ct.; reduces friction to a minimum, and prevents heat, wear, strain, and repairs of machinery. Send for envelope sample and circular to
AMERICAN GRAPHITE CO.
24 CLIFF NEW YORK

GEAR'S VARIETY MOLDING MACHINE. The Variety Molding Machine we purchased of you exceeds our expectations. We are highly pleased with it, and would recommend it to all wood-working establishments. BERKEY BROS. & CO. Manufacturers of Furniture. Grand Rapids, Mich.

E. C. STRANGE, Manufacturer of Patent Ground Cylinder Saws, Self-feeding Stave Machines, and Wrought Iron Tackle Blocks, Taunton, Mass.

Rolling Mills for Sale

AT AUCTION.

THE CALVERT IRON COMPANY, of Baltimore, will offer for sale, on THURSDAY AFTERNOON, Jan. 26 1871, at 1 o'clock P. M., at the Exchange Salesroom, their ROLLING MILLS and other property, situated on Boyle street, near Fort avenue, in the city of Baltimore.

The LOT fronts on Boyle street, 280 feet, running back 175 feet to an alley.

The MACHINERY is nearly new, and of the most approved description.

The main track of the Baltimore and Ohio Railroad passes near the property, and the wharves are but three squares distant. Cumberland bituminous coal is delivered by railroad within one square of the works. An unfailing supply of pure water is furnished by an artesian well.

Circulars giving full description of the property, with view and plans, will be sent on application.

The property can be examined at any time prior to sale.

Terms: One fourth cash, and balance in six, twelve, and eighteen months, with interest and approved security.

F. W. BENNETT & CO., Auctioneers.

$150 A MONTH! EMPLOYMENT! EXTRA INDUCEMENTS! A premium HORSE and WAGON for Agents. We desire to employ agents for a term of seven years, to sell the Buckeye $20.00 Shuttle Sewing Machine. It makes a stitch alike on both sides, and is the best low-priced licensed machine in the world. W. A. HENDERSON & CO., Cleveland, Ohio, or St. Louis, Mo.

To Furniture Manufacturers.

"THE KNAPP DOVETAILING MACHINE CO. have just completed their Automatic Dovetailer, which is sold to BEAL & HOOPER, of Boston. It will complete from 200 to 300 drawers per day."—*Cabinet Maker*, Boston.

The Company will be ready to fill orders early in March. The work done by this machine is entirely unlike, and greatly superior to, any other ever made.

All communications should be addressed to "THE KNAPP DOVETAILING MACHINE CO., NORTHAMPTON, MASS.

FOR BEDSTEAD & CHAIR MACHINREY, address T. R. BAILEY & VAIL, Lockport, N. Y.

IRON PLANER.

SECOND-HAND, 47x30 IN., 51 FT. BED, in excellent condition, for sale cheap. NILES WORKS, No. 222 East Front st., Cincinnati, Ohio.

MACHINERY, New and 2d-hand, bought, sold, and exchanged. Engines, Boilers, etc. W. WILLARD, 45 Dey st, N. Y.

KEY SEAT CUTTER.—This Machine will save the price of itself every three months in files. Address T. R. BAILEY & VAIL, Lockport, N. Y.

© 1871 SCIENTIFIC AMERICAN, INC

No

LIVE MECHANIC

Can afford to be without some of

BAIRD'S BOOKS

FOR PRACTICAL MEN.

My new and enlarged Catalogue of PRACTICAL AND SCIENTIFIC BOOKS, 82 pages, 8vo., will be sent, free of postage, to any one who will favor me with his address.

HENRY CAREY BAIRD,
Industrial Publisher, 406 Walnut St.,
PHILADELPHIA.

WOHLER'S FAMOUS

Chemical Analysis.

NOW READY.

Hand-Book of Mineral Analysis.

BY FREDERICK WOHLER,

Professor of Chemistry in the University of Göttingen. Edited by HENRY B. NASON, Professor of Chemistry in the Rensselaer Polytechnic Institute, Troy, N.Y. Illustrated. 1 vol. 12mo. Price $3.00. BY MAIL FREE OF POSTAGE.

Few more useful or valuable books on Chemical Analysis, for laboratory practice or industrial use, have ever been issued from the press. The work of one of the most famous of German Chemists, it has been edited for the American public by one of the first of American Chemists.

☞ The above or any of my Books sent by mail, free of postage. My **Catalogue of Practical and Scientific Books,** 82 pp. 8vo, complete to Jan. 15, 1871, will be sent, free of postage, to any one who will favor me with his address.

HENRY CAREY BAIRD,
INDUSTRIAL PUBLISHER,
406 Walnut st., Philadelphia, Pa.

CREDIT & CAPITAL.

McKILLOP, SPRAGUE & CO.,

Will issue about the 1st of January, 1871, their new volume of

The Commercial Agency Register.

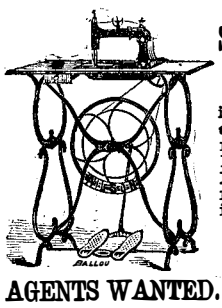
It will be the most COMPLETE AND VALUABLE work of its kind ever published. This is the only REFERENCE GUIDE giving, by their NEW KEY, a *CLOSE* estimate of the CAPITAL of each firm, in connection with their CREDIT ratings.

This Agency was established in 1842, and THE COMMERCIAL REGISTER has become a STANDARD WORK, and invaluable to dispensers of credit.

Two Editions are issued—January and July.

THE NEW WILSON

Under-Feed Shuttle



SEWING MACHINES!

$25 cheaper than any other!

For Simplicity, Durability and Beauty they stand *unrivalled!* For STITCHING, HEMMING, TUCKING, Felling, Quilting, Cording, BINDING, BRAIDING, GATHERING, Gathering & sewing on gathers, *they are unexcelled!*

For particulars address Wilson Sewing Machine Co., CLEVELAND, O.; BOSTON, MASS., or ST. LOUIS, MO.

AGENTS WANTED.

THEA NECTAR IS A PURE

BLACK TEA!

WITH THE

Green-Tea Flavor.

Warranted TO SUIT ALL TASTES.

FOR THE BEST GAGE LATHE IN THE world, for turning Broom, Rake, Hoe, and Fork Handles; also, Nulled Bedstead Work, Chair Stuff, etc., address T. R. BAILEY & VAIL, Lockport, N. Y.

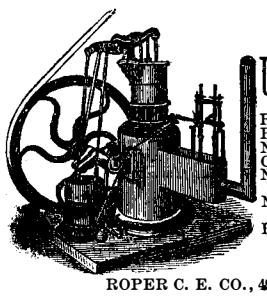
THE ONLY FAMILY KNITTER MADE that fills the bill. Send for circulars and samples to LAMB KNITTING MACHINE MANUFACTURING CO., Chicopee Falls, Mass.

PUMPS.—For Description, Price Lists etc., of the Best Centrifugal Pump ever invented, with Overwhelming Testimony in its favor, send for new illustrated pamphlet (36 pp.) to Messrs. HEALD SISCO & CO., Baldwinsville, N. Y.

Buy Barber's Bit Brace.

Caloric Engines.

1-2, 1, 2, AND 4 HORSE POWER.
Prices $350, $550, $750, $950.



ROPER'S NEW **IMPROVED**

Upright Engine

Runs still!
Packings do not burn!
No water used
Cannot explode!
No Insurance demanded!
Not liable to get out of order!
Requires no skilled Engineer, and costs to run 25 cts. per day per horse power.

ROPER C. E. CO., 49 Cortlandt st., N.Y.

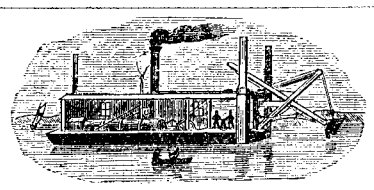
BRICKS. THE HOTCHKISS Brick Machine makes 20,000 bricks a day, which can be hacked immediately. It is simple, cheap, and durable. For making DRAIN TILE it is unrivaled. Can be seen working at Company's yard, Ridgefield, N. J. State, County, and Yard Rights for sale. Address FERRY FARM BRICK WORKS, (Room 7) No. 19, Cliff st., New York.

Machinery for Sale.

ONE DOUBLE-CYLINDER HOE PRINTING PRESS, size of bed 34 by 50 inches; one eight-horse Steam Engine and Boiler, the latter nearly new; one Donkey Engine, etc., all in good order. Will be sold together or separately AT VERY LOW PRICES.
Apply at **No. 4 Cedar street,** New York.
☞ Can be seen at 39 Center st., on application to WM. PARKHURST, 41 Center street, Basement.

ROBERT McCALVEY, Manufacturer of HOISTING MACHINES AND DUMB WAITERS. 602 Cherry street, Philadelphia, Pa.

FOR MALLEABLE IRON CASTINGS, and Patterns for same, address McCONWAY, TORLEY & CO., 869 Liberty st., Pittsburgh, Pa.



TO CONTRACTORS. — Superior Steam Dredges, Steam Hoisting Derricks, Upland Excavators, Stationary and Marine Engines, and all kinds of Machinery, made to order, by the POUND MANUFACTURING CO., Lockport, N. Y.

STEAM Gages, large assortment, self-testing, & original Ashcroft steam gage. E. H. Ashcroft, Boston.

SILICATE OF SODA, IN ITS VARIOUS forms, manufactured as a specialty, by Philadelphia Quartz Co., 783 South 2d st., Philadelphia, Pa.

OTIS' SAFETY HOISTING **Machinery.**
OTIS, BROS. & CO.
No. 309 BROADWAY, NEW YORK.

Wanted—Agents. $75 TO $250 PER MONTH, everywhere, male and female, to introduce the GENUINE IMPROVED COMMON-SENSE FAMILY SEWING MACHINE. This Machine will stitch, hem, fell, tuck, quilt, cord, braid, and embroider in a most superior manner. Price, only $15. Fully licensed and warranted for five years. We will pay $1,000 for any machine that will sew a stronger, more beautiful, or more elastic seam than ours. It makes the "Elastic Lock Stitch." Every second stitch can be cut, and still the cloth cannot be pulled apart without tearing it. We pay Agents from $7 to $250 per month and expenses, or a commission from which that amount can be made. Address SECOMB & CO.,
Boston, Mass.; Pittsburgh, Pa.; St. Louis, Mo., Chicago, Ill.

HOWARD, THORNDIKE & Co. BELFAST. MAINE
HOWARD'S IMPROVED ADJUSTABLE MITRE MACHINES
ADDRESS:

PATENT BANDSAW MACHINES of the most improved kinds, of various sizes, to saw bevel as well as square, without inclining the table, by FIRST & PRYIBIL, 452-456 Tenth ave., New York. Price, $250 $275, $350, and $400. At present, Oct. 16, there are in operation, in this city alone, 88 of our machines. Send for Circular. Manufacture also, an improved saw-filing apparatus, price, $30. Have also on hand a large stock of best French Bandsaw Blades.

WOOD-WORKING MACHINERY GENerally. Specialties, Woodworth Planers and Richardson's Patent Improved Tenon Machines. Nos. 24 and 26 Central, corner Union st., Worcester, Mass. Warerooms 42 Cortlandt st., New York.
WITHERBY RUGG, & RICHARDSON.

THE CELEBRATED

Cold-rolled Shafting.

THIS Shafting is in every particular superior to any turned Shafting ever made. It is the most ECONOMICAL SHAFTING to buy, being so very much stronger than turned Shafting. Less diameter answers every purpose, causing a great saving in coupling, pulleys and hangers. It is perfectly round, and made to Whitworth Gage. All who give it a trial continue to use it exclusively. We have it in large quantities. Call and examine it, or send for price list.
Address GEORGE PLACE & CO.,
126 and 128 Chambers st., New York.

N. Y. Machinery Depot.

GEORGE PLACE & CO., Manufacturers and Dealers in Wood and Iron Working Machinery, of every description, Stationary and Portable Engines and Boilers, Leather and Rubber Belting, and all articles needful in Machine or Railroad Repair Shops. 126 and 128 Chamber st., New York.

Sturtevant Blowers.

THESE are in every particular the best and most perfect Blower ever made. A full assortment of every size on hand, ready to deliver.
Address GEORGE PLACE & CO.,
126 and 128 Chamber st., New York.

Gear's Variety Molding

Machine is the best in the world. Send for Circular.
A. S. & J. Gear & Co., Boston, Mass.
☞ CAUTION.—It is an infringement to use the N. Y. V. Machine anywhere except in New York. Take Notice. We mean business.

BENT, GOODNOW & CO.,
Boston, Mass., Publishers of "PATENT STAR," sell Patent Rights and goods of all kinds. Orders solicited. AGENTS WANTED.
☞ Send stamp for copy.

PATENT RIGHTS SOLD ON COMMISSION.

By E. E. ROBERTS & CO., Consulting Engineers, 15 Wall St., N. Y. Send Stamp for Circular.

WOODBURY'S PATENT

Planing and Matching

and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS, { 91 Liberty street, N. Y.; 67 Sudbury street, Boston.
Send for Circulars.

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash, and molding, Tenoning, Mortising, Boring, Shaping, Vertical, and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty st., New York. 17 1

Niagara Steam Pump.

CHAS. B. HARDICK,
Adams st., Brooklyn, N. Y.

WROUGHT IRON BEAMS & GIRDERS

THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided, we are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph address the Union Iron Mills, Pittsburgh, Pa.

L. W. Pond's New Tools.

NEW AND IMPROVED PATTERNS—Lathes, Planers, Drills, Milling Machines, Boring Mills, Gear and Bolt Cutters, Punches and Shears for Iron. Office

98 9 Ate 98

Liberty st., New York. Works at Worcester, Mass.

MODELS, PATTERNS, EXPERIMENTAL, and other machinery, Models for the Patent Office, built to order by HOLSKE MACHINE CO., Nos. 528, 530, and 532 Water st., near Jefferson. Refer to SCIENTIFIC AMERICAN office. 14 tf

---

1832. SCHENCK'S PATENT. 1870.

Woodworth Planers.

And Re-Sawing Machines, Wood and Iron Working Machinery, Engines, Boilers, etc. JOHN B. SCHENCK & SON, Matteawan, N. Y., and 118 Liberty st., New York.

WANTED—AGENTS, $20 PER DAY, TO sell the celebrated HOME SHUTTLE SEWING MACHINE. Has the under-feed, makes the "lock stitch" alike on both sides, and is fully licensed. The best and cheapest Family Sewing Machine in the market. Address
JOHNSON, CLARK & CO.,
Boston, Mass.; Pittsburgh, Pa.; Chicago, Ill., or St. Louis, Mo.

Milling Machine,

INDEX, STANDARD, UNIVERSAL, AND HORIZONTAL.—The largest variety to be found in the country, on hand and finishing. Workmanship, Material, and Design unsurpassed. Machines on exhibition at Fair of American Institute. UNION VISE CO. OF BOSTON. Office 80 Milk st. Works at Hyde Park, Mass.

EVERY MAN HIS OWN PRINTER.

With one of our presses, and the material accompanying it, every man can do his own printing, thus saving much time and expense. Circulars containing full information about these presses, prices, recommendations, &c., mailed free on application. Specimen-books of types, cuts, borders, &c., &c., 10 cents. ADAMS PRESS CO., 53 Murray street, New York.

CINCINNATI BRASS WORKS. — Engineers and Steam Fitters' Brass Work, Best Quality at very Low Prices. F. LUNKENHEIMER, Prop'r.

Vertical Corn Mills,

AND **COMBINED**

GRINDING & BOLTING MILLS.

For Flour, Fine Meal, Spices, Drugs, etc.
EDWARD HARRISON, New Haven, Conn.

SCROLL SAW. — McChesney's, Patented March 16th and Nov. 1st, 1870. First Prize Fairs Am. Institute, 1869 and 1870, and Virginia State Fair, 1869. Send for circular and price. Wanted—Parties to manufacture on royalty, or would sell patent.
THOS. L. CORNELL, Derby, Conn.

$75 Per week easily made by Agents. Address SAGE MAN F'G Co., Cromwell, Conn.

MAYERS' PATENT GIG SAW, manufactured and sold by FIRST & PRYIBIL, 452 10th ave., New York city, will do any kind of scroll sawing. Send for price list, and more particulars.

WATER POWER for Rent or Sale.—The Ousatonic Water Co. offer fine Mill Sites, permanent Water Power, and unsurpassed facilities to manufacturers; only 3 hours from New York, with rail and water communication. Address Ousatonic Water Co., Derby, Ct.

CEMENT. THE COPLAY CEMENT CO. will contract for future delivery. A stock always in store to fill orders. JOSIAH J. ALLEN, 4 South Del. ave., Philadelphia, Pa.

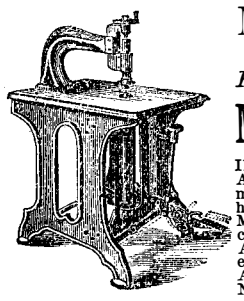
LATHE CHUCKS—HORTON'S PATENT from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON, Windsor Locks, Conn.

$25 A WEEK. Local and traveling salesmen wanted. Business light and HONORABLE. No "Gift Enterprise," "Cheap Jewelry," or "Bogus Money" swindle. Address, inclosing stamp,
R. H. WALKER, 34 Park Row, New York.

PORTABLE STEAM ENGINES, COMBINing the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than **750** being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address
J. C. HOADLEY & CO., Lawrence, Mass.
46. Cortlandt st., New York.

FOR SALE.—
1 Second-hand Lathe, 26x15 feet bed.
1 " " 16x10 " "
2 " Upright Drills.
2 " Planers, 7 ft. x30 in.
POST & CO., Cincinnati, Ohio

SHINGLE AND HEADING MACHINE—Law's Patent with Trevor & Co.'s Improvements. The Simplest and Best in use. Also, Shingle, Heading and Stave Jointers, Equalizers, Heading Turners, Planers etc. Address TREVOR & CO., Lockport, N. Y.



M. T. BOULT'S

PATENT

Paneling, Carving, &

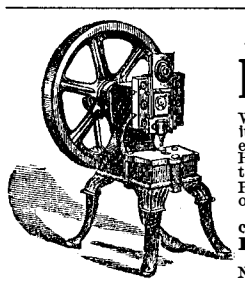
Molding Machine

Illustrated in SCIENTIFIC AMERICAN, Dec. 3, 1870, manufactured by Burnham & Hyde, Battle Creek, Mich; also, Barker's Machine for FLUTING BALASTERS, TABLE LEGS, etc. E. P. HAMPSON, Agent, 98 Cortland street, New York.

Union Emery Wheels.

Solid and with Stone Center.
UNION STONE CO., Boston, Mass. Branch Office, 93 Liberty st., N.Y. General Agents for the Am. Twist Drill Co.'s Superior Grinder and other Emery Wheel Machinery and Tools. Send for Circular.

FOR SALE.—A Machine for Fluting Cotton Machinery Rolls, in good order, and but little used. Also, two Wheatstone's Telegraphing Instruments, suitable for private telegraphs, in good order.
Apply to PROVIDENCE TOOL CO. ARMORY, Providence, R. I.



PARKER Punching Presses

With Patent Eccentric adjustment, to raise and lower the punch. All power Presses, having an eccentric adjustment of the Punch, are infringements of our Patent.
☞ Send for Circular and copy of our Patent.
PARKER BROS.
West Meriden, Conn.
New York, 27 Beekman st.

THE PATENT on the Parker Press referred to above was never designed to adjust the Punch, but to change the stroke only. The Eccentric Ring in it is keyed to the shaft, and revolves with it, while mine is NOT fastened to the shaft, and does not revolve with it; neither is the stroke in mine changed. Parker Bros. do not make Presses after their Patent, but infringe mine. Be not deceived. N. C. STILES.

Andrew's Patents.

Noiseless, Friction Grooved, Portable, and Warehouse Hoisters.
Friction or Geared Mining & Quarry Hoisters.
Smoke-Burning Safety Boilers.
Oscillating Engines, Double and Single, 1-2 to 100-Horse power.
Centrifugal Pumps, 100 to 100,000 Gallons per Minute, Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury.
All Light, Simple, Durable, and Economical.
Send for Circulars.
WM. D. ANDREWS & BRO.,
414 Water street, New York.

IMPORTANT

TO MACHINISTS.—The Best Metal for all Machine Uses is the MARTIN STEEL, made by THE NEW JERSEY STEEL AND IRON CO., Trenton, N. J. This steel is made by an entirely different process from any other, and is tougher than wrought iron. It can be turned without annealing, being entirely free from hard spots. Every one who uses it pronounces it just what they have long wanted, for a multitude of uses, such as Crank Pins, Lathe Spindles and Screws, Cotton Machinery Rollers, Saw and Fan Spindles, etc., etc. Also, particularly adapted for Firebox Plates. Prices low. Send for further information, or a sample, stating use to which it is to be applied.

AGENTS WANTED—($225 A MONTH) by the AMERICAN KNITTING MACHINE CO. Boston, Mass., or St. Louis, Mo.

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK,
P. O. Box 1,057 Boston, Mass.
N. B.—This detector is covered by two U. S. Patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

BURDON IRON WORKS.—Manufacturers of Pumping Engines for Water Works, High & Low Pressure Engines, Portable Engines and Boilers, of all kinds, Sugar Mills, Screw, Lever, Drop, & Hydraulic Presses, Machinery in general. HUBBARD & WHITTAKER, 102 Iron st. Brooklyn.

U.S. PIANO CO. N.Y. Best in the World—Sent on trial—See large cut and terms in Scientific American, Oct. 1st, 1870. **$290.**

MACHINERY, NEW and 2d-HAND.—Send for Circular. CHAS. PLACE & CO., 60 Vesey st., New York.

1826 USE THE VEGETABLE **PULMONARY BALSAM.** **1870**
The old standard remedy for Coughs, Colds, Consumption. "Nothing Better." CUTLER BROS. & Co., Boston.

$15,000 A YEAR.

WANTED—AGENTS—
To sell the Universal Sewing Machine, size, 12-in. long by 8 in hight, of great capacity and durability, works on a new principle. Price, complete, $15, sent C. O. D.
UNIVERSAL S. M. CO.,
58 Bromfield street, Boston, Mass.

$5 TO $10 PER DAY. MEN, WOMEN, BOYS and GIRLS who engage in our new business make from **$5 to $10 per day** in their own localities. Full particulars and instructions sent free by mail. Those in need of permanent, profitable work, should address at once. GEORGE STINSON & Co., Portland, Maine.

TO THE WORKING CLASS.—We are now prepared to furnish all classes with constant employment at home, the whole of the time or for the spare moments. Business new, light and profitable. Persons of either sex easily earn from 50c. to $5 per evening, and a proportional sum by devoting their whole time to the business. Boys and girls earn nearly as much as men. That all who see this notice may send their address, and test the business, we make this unparalleled offer: To such as are not well satisfied, we will send $1 to pay for the trouble of writing. Full particulars, a valuable sample which will do to commence work on, and a copy of *The People's Literary Companion*—one of the largest and best family newspapers published—all sent free by mail. Reader, if you want permanent, profitable work, address E. C. ALLEN & CO., AUGUSTA, MAINE.

PORTABLE AND STATIONARY STEAM Engines and Hoisting Engines. A good article at low prices. Every machine warranted. Send for descriptive Price List. H. B. BIGELOW & CO.,
New Haven, Conn.

© 1871 SCIENTIFIC AMERICAN, INC

Receipts—When money is paid at the offic for subscriptions, a receipt for it will be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona-fide* acknowledgment of their funds.

City Subscribers.—The SCIENTIFIC AMERICAN will be delivered in every part of the city at $3·50 a year. Single copies for sale at the News-stands in this city, Brooklyn, Jersey City, and Williamsburgh, and by most of the News Dealers in the United States.

Subscribers—Who wish to have their volumes bound, can send them to this office. The charge for binding is $1·50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line for each insertion. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

The Eureka Grinders.

E. W. PHELPS' Patent June 21, 1870, awarded the First Premium—Bronze Medal and Diploma—for the best SAW GUMMER and SHARPENER, at the Fair of the American Institute, October, 1870. For gumming and sharpening Saws, Molding Cutters, Mowing Machine Knives, and many other uses, there is nothing of the kind to compare with them. They are got up and operated on entirely new principles, and capable of performing a greater variety of work, and in more perfect order, and are more easily operated, than any other. All of which the Machines are *guaranteed capable of doing*. Send for descriptive circular before purchasing any other.

Wanted, responsible parties to manufacture and sell on royalty. Address E. W. PHELPS, Patentee and Manufacturer, Elizabeth, N.J.

Machinists' Tools.

NILES TOOL WORKS,

CINCINNATI, OHIO,

HAVE ON HAND ENGINE LATHES, 14, 18, 22, and 26 inches swing; IRON PLANERS, BORING and TURNING MILLS, GRAY'S PAT. UNIVERSAL RADIAL DRILLING MACHINES, CAR-WHEEL BORERS, AXLE LATHES, and other first-class Iron Working Machinery, at moderate prices.

CELEBRATED

25° TO 29° GALENA OILS.

ENGINE, CAR and MACHINERY OILS.

☞ Petroleum reduced to a desired gravity by Whale Oil admits of no superior as a lubricator. All oils warranted as represented. GALENA OIL WORKS, Franklin, Pa. CHAS. MILLER, Manager. R. H. AUSTIN, Pres.

GRINDSTONES. FOUNDED IN 1810.

J. E. MITCHELL, Philadelphia, Pa.

MANUFACTURERS AND OTHERS, wanting to make on royalty the best and cheapest Hay, Straw, and Stalk Cutter, hand or horse power, having he knives furnished, write to NEW YORK PLOW CO., 94 Beekman st., New York.

"Buckeye" Hominy Mill.

IN THE WORKING OF THIS MILL THE Corn requires no preparation except shelling. It has a regular feed and discharge, and needs but little attention. IT IS COMPLETE IN ITSELF. Hominy can be made from common as well as flint corn. It occupies very little room, and any miller can work it. There is nothing a miller can manufacture to a better profit than Hominy. Send for Circulars. BALTIMORE PEARL HOMINY CO., Baltimore, Md., Sole owners of Patent.

UNION

Spoke Works.

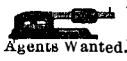
SPOKES, RIMS, AND PLOW HANDLES. All goods warranted seasoned, and of the best quality. JOHN G. DAVIS & SON, Southwest cor. of Leopard and Otter sts., Philadelphia.

ENGINEERING, MANUFACTURING and BUILDING.—**$8.00** a year will procure the three best industrial journals in the country, viz: THE TECHNOLOGIST, VAN NOSTRAND'S ENGINEERING MAGAZINE, and the SCIENTIFIC AMERICAN. For specimen copy (free) of THE TECHNOLOGIST, containing Club Rates, address THE INDUSTRIAL PUBLICATION CO., 176 Broadway, N.Y.

WATER-PROOF

BUILDING PAPER

For Roofing, Sheathing, Ceilings, Oil-cloths, Shoe Stiffenings, Tags, Trunks, Cartridges, Blasting, Pass-book Covers, Grain and Flour Bins, etc., for sale by HUNTER & POSTLEY, Paper Warehouse, 59 Duane st., New York.



BEST DAMPER REGULATOR for Steam Boiler. Send for Circulars. Agents Wanted. MURRILL & KEIZER, Baltimore, Md.

Newspaper Advertising.

A Book of 125 closely printed pages, lately issued, contains a list of the best American Advertising Mediums giving the names, circulations, and full particulars concerning the leading Daily and Weekly Political and Family Newspapers, together with all those having large circulations, published in the interest of Religion, Agriculture, Literature, etc., etc. Every Advertiser, and every person who contemplates becoming such, will find this book of great value. Mailed free to any address on receipt of 25c.

GEO. P. ROWELL & CO.,
Publishers, No. 40 Park Row, New York.

The Pittsburgh (Pa.) Leader, in its issue of May 29, 1870, says:

"The firm of G. P. Rowell & Co., which issues this interesting and valuable book, is the largest and best Advertising Agency in the United States, and we can cheerfully recommend it to the attention of those who desire to advertise their business SCIENTIFICALLY and SYSTEMATICALLY in such a way: that is, so as to secure the largest amount of publicity for the least expenditure o money."

RUMPFF & LUTZ,

IMPORTERS and Manufacturers of Aniline Colors and Dyestuffs, Colors for Paperhangers and Stainers. Reliable recipes for Dyeing and Printing on Silk, Wool, and Cotton. All new improvements in the art of Dyeing, and new Colors are transmitted to us by our friends in Europe, as soon as they appear.
42 Beaver street, New York.

L. L. SMITH, 6 Howard st., New York.

Nickel Plater.

First Premium at the Fair of the American Institute, 1869. Licenses (under the Adams Patents), granted by the U. N. Co., 17 Warren st., New York.

Canadian Inventors,

Under the new Patent Law, can obtain patents on the same terms as citizens.

For full particulars address
MUNN & CO.,
37 Park Row, New York.

SCHLENKER'S PATENT
BOLT CUTTER
NEW INVENTION. ADDRESS,
HOWARD IRON WORKS, BUFFALO, N.Y.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northamoton Emery Wheel Co., Leeds, Mass.

MCNAB & HARLAN, Manufacturers of Wrought Iron Pipe and Fittings, Brass Cocks, Valves, Gage Cocks, Whistles, Water Gages, and Oil Cups, Harlin's Patent Lubricator, Plumber's Brass Work, Getty's Patent Pipe Cutter, Getty's Patent Proving Pump and Gage. No. 86 John st., New York.

EMPLOYMENT.

$250 A MONTH with Stencil Dies. Samples free. Address S. M. SPENCER Brattleboro Vt.

THE

Tanite Emery Wheel.

Does not Glaze, Gum, Heat, or Smell. Address THE TANITE CO., Stroudsburg, Monroe Co., Pa.

SELECTED Sperm Oil.—Warranted strictly Pure. For Sewing Machines and all fine machinery in bottles, cans, bbls., casks. W. F. Nye, New Bedford, Mass.

WOOD'S **HOUSEHOLD MAGAZINE** contains in every number one complete prize story valued at $100. Forty pages of other matter. Yearly $1. Sold by news dealers at 10 cents per copy. Splendid Premiums. $500 cash to be awarded for prize clubs. Specimen copy free. Address S. S. WOOD, Newburgh, N. Y.

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of superior quality, on hand, and finishing. For sale low. For Description and Price, address NEW HAVEN MANUFACTURING CO. New Haven, Conn.

FOR CIRCULAR OF TREMPER'S PATENT VARIABLE CUT-OFF, for high and low pressure Steam Engines, address PUSEY, JONES & CO., Wilmington Delaware.

Trade-Mark Patents.

MUNN & CO. desire to call the attention of manufacturers and business men generally, to the importance of the law of patents, as applied to trade-marks for business purposes.

Any person, firm, or corporation, domiciled in the United States, or in any foreign country affording similar privileges to citizens of the United States, can obtain the right to the exclusive use, for THIRTY YEARS, of any TRADE-MARK, consisting of any new figure, or design, or any new word, or new combination of words, letters, or figures, upon their manufactures.

This protection extends to trade-marks already in use or any length of time, or about to be adopted.

Full information on this important subject can be obtained by addressing
MUNN & CO.
37 Park Row, New York.

HARD WOOD BOARDS
and Spanish Cedar
FOR CIGAR BOXES,

And a large and magnificent assortment of

VENEERS,

Comprising everything in their line, both Foreign and Domestic, to which they invite the special attention of all dealers. Send for Catalogue and Price List.

GEO. W. READ & CO.,
Factory { 291 Monroe st. / 398 Madison st. } 168, 170, & 172 Center st., N.Y. city.

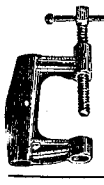
To Dyspeptics.

WE do not agree to cure you, but from a careful analysis of DOOLEY'S YEAST POWDER, we can safely recommend it as producing nutritious, light, healthy bread, biscuits, rolls, etc., which can be eaten with impunity, and relished by the most sensitive invalid. These facts we can substantiate from practical observations, and with the knowledge that no injurious substances whatever enter into the composition of DOOLEY'S YEAST POWDER. Grocers everywhere keep it. DOOLEY & BROTHER, Manufacturers, 69 New st., New York.

Reynolds'
TURBINE WATER WHEELS.

The Oldest and Newest. All others only imitations of each other in their strife after complications to confuse the public. We do not boast but quietly excel them all in staunch reliable, economical power. Beautiful pamphlet free. GEO. TALLCOT, 96 Liberty st., New York.
Gearing, Shafting.

FOR CIRCULAR ILLUSTRATING A NEW and greatly improved TURBINE WHEEL, believed to be the best and cheapest in the market, apply to PUSEY JONES & CO. Wilmington Delaware.



LECOUNT'S PATENT HOLLOW LATHE DOGS AND CLAMPS.—A set of 8 Dogs from ⅜ to 2-in., inclusive, $8. A set of 12 from ⅜ to 4-in., $17·30. Five sizes Machinists' Clamps, from 2 to 6-in., inclusive, $11. Send for Circular.
C. W. LECOUNT, South Norwich, Conn.

London.....48 Cannon street.

H. KOHNSTAMM, MANUFACTURER OF

ULTRAMARINE,

And Importer of English, French, and German Colors, Paints, and Artists' Materials, Bronzes, and Metals. No. 100 Chambers st. bet. Broadway and Church st., N. Y.

BUILDING PAPER

OF THREE GRADES.

SHEATHING BOARD,
For outside of Studding, under Clapboards. A non-conductor of cold, heat, and dampness.

PREPARED PLASTERING BOARD
a cheap and perfect substitute for lath and plaster; makes a smooth, substantial wall, at less tean half the usual cost.

DOUBLE THICK ROOFING,
Made entirely of Wool Felt, a cheap and perfect article.

Sample and Circulars sent free, by ROCK RIVER PAPER CO., Chicago; or,
B. E. HALE, 22 & 24 Frankfort street, N. Y.

DRILLS

DIAMOND POINTED

STEAM DRILLS.

FOR ALL KINDS OF ROCK DRILLING, Mining, Quarrying, Tunneling, Railroad Grading, Well Boring, Prospecting, etc. Fifty to Seventy-five per cent of cost and time of hand labor saved. "Test Cores," in form of solid cylinders of rock or mineral taken out of mines from any depth not exceeding one thousand feet, showing true value, stratification, etc. No percussion. Never require sharpening. FIRST PREMIUMS awarded in both American and Europe. Illustrated Circulars sent on application. Beware of infringements.

SEVERANCE & HOLT,
Proprietors and Manufacturers,
Office 16 Wall st., New York.

WIRE ROPE.

JOHN A. ROEBLING'S SONS,

MANUFACTURERS, TRENTON, N. J.

FOR Inclined Planes, Standing Ship Rigging, Bridges, Ferries, Stays, or Guys on Derricks & Cranes, Tiller Ropes, Sash-Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes. A large stock constantly on hand at New York Warehouse, No. 117 Liberty street.

American Saw Co., Manufacturers of

And Perforated Circular, Long, and Hand Saws. Also Solid Saws of all kinds. No. 1 Ferry st., cor. Gold street, New York. Branch Office for Pacific Coast, No. 606 Front street, San Francisco, Cal.

Water Wheels.

WARREN'S NEW GRADUATING TURBINE.

Wherever tried no others are used. Send for circular of 1870. A. WARREN, Ag't. 31 Exchange st., Boston, Mass.

THE

Allen Engine Works,

THE ALLEN ENGINE.

Fourth avenue and 130th and 131st sts., New York city Manufacturers of

Porter's Governor,
The Allen Boiler, and
Standard Straight Edges, Surface Plates, and Angle Plates.

Four first premiums were awarded to us at the Fair of the American Institute, 1870.
Send for our illustrated circular.

PATENT COLD ROLLED SHAFTING.

The fact that this Shafting has 75 per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price Lists mailed on application to JONES & LAUGHLINS, 120 Water street, Pittsburgh, Pa.

☞ Stocks of this Shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass.
GEO. PLACE & CO., 126 Chambers street, N. Y.

Working Models

And Experimental Machinery, Metal, or Wood, made to order, by J. F. WERNER 62 Center st., N.Y.

SAW MILLS.

MORRISON & HARMS' IMPROVED MULEY Saw Hangings are the best in the world. MORRISON & HARMS, Allegheny City, Pa.

A. S. & J. GEAR & CO., Boston, furnish every description of Wood and Iron Working Machinery and Supplies. The best in use, regardless of maker, at lowest possible rates.

P. BLAISDELL & CO.,

BUILDERS OF A NEW PATTERN 12-in. Swing Lathe, designed for Sewing Machine Works, the "Blaisdell" Patent Drill Presses and other first-class Machinists' Tools, Jackson street, Worcester, Mass.

THE WOODWARD STEAM-PUMP MANUFACTURING COMPANY, Manufacturers of the Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Also Dealers in Wrought-Iron Pipe, Boiler Tubes, etc. Hotels, Churches, Factories, & Public Buildings heated by Steam, Low Pressure. Woodward Building, 76 and 78 Center st., cor. of Worth st. (formerly of 77 Beekman st., N. Y. All parties are hereby cautioned against infringing the Pat. Right of the above Pump. G. M. WOODWARD, Pres't.

☞ T. V. Carpenter, Advertising Agent. Address hereafter, Box 773, New York city.

Harrison *Safety Boiler.*

First-class Medal, World's Fair, London, 1862.
And American Institute Fair, New York, 1869.
Over 1,000 Boilers in Use.

Weston's Patent Differential
PULLEY BLOCKS.

75,000 IN USE.

Address
HARRISON BOILER WORKS,
Philadelphia, Pa.
or, **JOHN A. COLEMAN,** Agent,
110 Broadway, New York, and 139 Federal st., Boston.

DOYLE'S
PATENT DIFFERENTIAL
Pulley Blocks.

The celebrated **Doyle Blocks** have taken premiums over the differential Blocks of all other makers at every Fair where they have been exhibited at the same time. WHEN YOU BUY, SEE THAT THE BLOCKS ARE MARKED J. J. DOYLE. Pat. Jan. 8, 1861. All others are infringements.

SAMUEL HALL'S SON & CO.,
SOLE MANUFACTURERS.
229 West 10th street, New York.

HEAVY CASTINGS

For Forge and Mill Work. The M. & T. SAULT CO. Steam Engine Builders & Founders, New Haven, Conn.

IRON STEAMSHIP BUILDERS.

NEAFIE & LEVY,
PENN WORKS,

MARINE ENGINES, BOILERS, ETC.,
PHILADELPHIA, PA.

Swain Turbine.

"Our Low-Water Wheel from this on"

WILL DO TEN PER CENT MORE WORK on small streams, in a dry season, than any wheel ever invented. Gave the best results, in every respect, at the Lowell Tests.

For Report of tests at Lowell, with Diagrams and Tables of Power, address
THE SWAIN TURBINE CO.,
North Chelmsford, Mass.

Scientific American
For 1871.

TWENTY-SIXTH YEAR.

This splendid weekly, greatly enlarged and improved, is one of the most useful and interesting journals ever published. Every number is beautifully printed on fine paper, and elegantly illustrated with original engravings, representing

New Inventions; Novelties in Mechanics, Manufactures, Chemistry, Photography, Architecture, Agriculture, Engineering, Science and Art.

Farmers, Mechanics, Inventors, Engineers Chemists, Manufacturers, and People of all Professions or Trades will find the

SCIENTIFIC AMERICAN
OF GREAT VALUE AND INTEREST.

Its practical suggestions will save hundreds of dollars to every Household, Workshop, and Factory in the land, besides affording a **Continual Source of Valuable Instruction.** The Editors are assisted by many of the **ablest American and European Writers,** and having access to all the leading Scientific and Mechanical Journals of the world, the columns of the *Scientific American* are constantly enriched with the **choicest Information.**

An OFFICIAL LIST of all the Patents Issued is Published Weekly.

The Yearly Numbers of the *Scientific American* make *Two Splendid Volumes of nearly One Thousand Pages,* equivalent in size to *FOUR THOUSAND ORDINARY BOOK PAGES.*

Specimen Copies sent free.

TERMS—$3 a Year; $1.50 Half Year; Clubs of Ten Copies for One Year, at $2.50 each, $25.00,

With a *SPLENDID PREMIUM* to the person who forms the Club, consisting of a copy of the celebrated Steel Plate Engraving, "Men of Progress."

In connection with the publication of the Scientific American, the undersigned conduct the most extensive Agency in the world for procuring PATENTS.

The best way to obtain an answer to the question—*Can I obtain a Patent?* is to write to *Munn & Co., 37 Park Row, N. Y.,* who have had over Twenty-five Years' Experience in the business. No charge is made for opinion and advice. A pen-and-ink sketch, or full written description of the Invention, should be sent.

For Instructions concerning American and European Patents—Caveats—Re-issues—Interferences—Rejected Cases—Hints on Selling Patents—Rules and Proceedings of the Patent Office—The New Patent Laws—Examinations—Extensions—Infringements, etc., etc., send for *INSTRUCTION-BOOK,* which will be mailed free, on application. All business strictly confidential.

Address, **MUNN & CO.,**
Publishers of the Scientific American,
37 Park Row, New York.

The "Scientific American" is printed on a Hughes & Kimber Double-feed Wharfedale Press, for which Victor E. Mauger, New York and Montreal, is sole Agent.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard sts. Philadelphia, and 59 Gold st. New York.

© 1871 SCIENTIFIC AMERICAN, INC